

Pages to Go:

Preserving Document
Formats Across Platforms



**NETWORK
EDITION**
MAGAZINE

Free Utility:
DRVLOAD Lets
You Start Device
Drivers from DOS

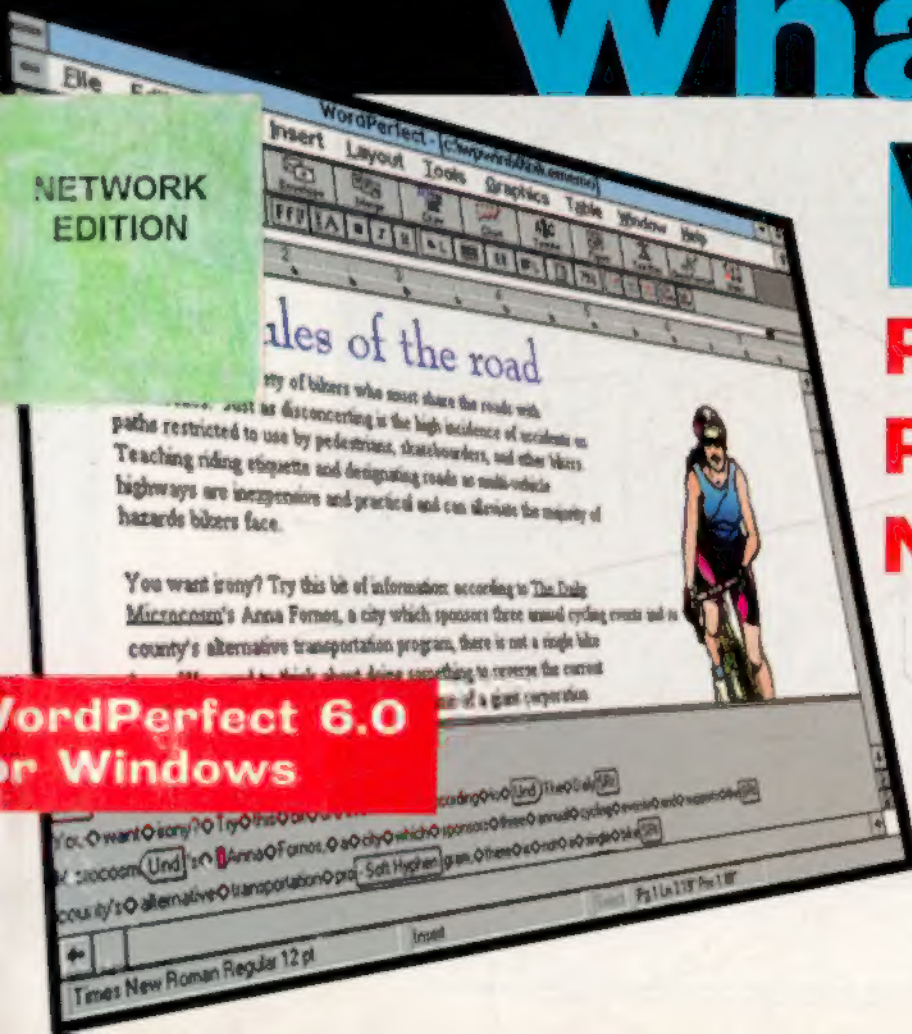
SQL Data Access:
Power Tools That
Build Slick
Corporate Apps

Word Processing



**Microsoft Word
6.0 for Windows**

What's New



**WordPerfect 6.0
for Windows**

What's Next

**PC Labs Reviews 9 Top Word
Processors and Previews the
New WinWord and WordPerfect**

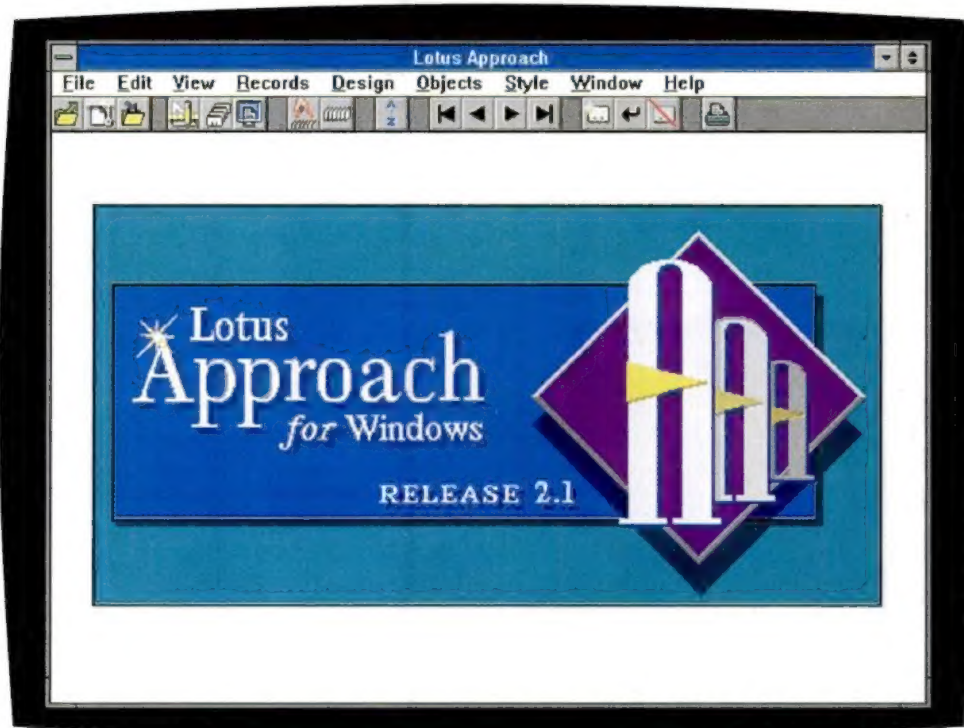
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world is no good if you can't use it. Approach is expressly designed to be easy. There's no programming to learn. No endless documentation to study. And according to independent

it. It was just too difficult to get a handle on.* That's not surprising considering the 543 page supplemental language reference for programmers Don would've had to pore



Approach lets you get to work right away in familiar, easy to understand desktop items. You can generate reports, forms or form letters — you can even print mailing labels to match any specification.

through. Which looks like light reading next to Paradox's 1300 pages of programming instruction.

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According to Don, I tried Access and shelved

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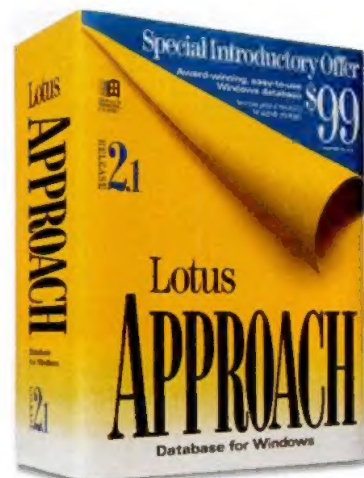
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Inside

As ubiquitous as the PC has become, we sometimes forget that its current uses far surpass what could have been imagined a decade ago. In this issue, we look at a number of hot technologies that continue to expand the desktop computer's reach and capabilities.

One of these technologies is PCI, the new bus standard driven by Intel. "PCI Local Bus Has Arrived" explains how PCI solves many of the PC's I/O bottlenecks.

If the paperless office ever becomes reality, it may be because we finally have portable documents, which maintains styles and fonts across various computing platforms. In "Can Form Follow Content?" our Graphics team tells you how—as well as how well—these products work.

Our story on front ends to SQL databases, "SQL: Putting Up a Good Front," is a measure of the ways companies are shifting important applications down to PCs. Just a few years ago, few managers would have imagined entrusting their precious corporate data to those little beige boxes.

This article also reminds us of the most fundamental change in computing in the nineties: the network. Networks have given us

use of expensive resources, allowed us to tap databases that were once inaccessible, and enabled us to share data without leaving our desks.

As the tentacles of networking spread, we have to guard against another phenomenon, recentralization. There is a temptation in some organizations to use



the network to regain control of the desktop, to limit the use of software, and to tightly restrict access to data.

Any administrator who tries to do this misses the point. Users have become accustomed to doing it their way. The value of the PC is the rich variety of options it gives the user. There is no turning back.—Joel Dreyfuss

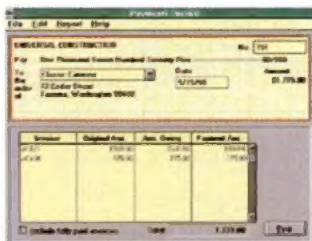
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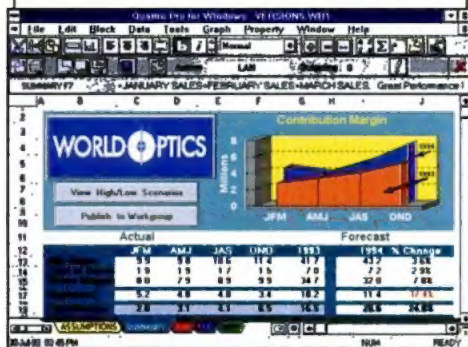
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BY EDWARD MENDELSON

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PCI Local Bus Has Arrived

BY DAVE ROWELL The PCI bus is finally here. With its arrival comes the promise of smooth, full-motion video as well as the ability to exploit the power of the Pentium chip. Will it replace the VL-Bus as the local bus of choice, or will it follow the EISA and MCA buses and fail to win a large following? *PC Magazine* takes a long, hard look187

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Can Form Follow Content?

BY PAULINE ORES As the paperless office moves from theory to reality, being able to exchange documents across platforms while retaining the original format becomes increasingly important. We examine three portable document exchange solutions and their role in the coming Information Age and why more of us will be familiar with terms like *smgl* and *cross-platform exchange*203

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SQL: Putting Up a Good Front

BY SHERYL CANTER In the realm of client/server SQL databases, a whiz bang back-end engine is only as useful as the front end on the user's desktop. With the latest wave of GUI development tools, programmers can quickly build powerful, visually striking client applications that let corporate users access, update, and analyze server data. We test six OS/2 and Windows development environments recommended by the leading SQL database vendors237

SQL Access Simplified

BY STEPHEN W. PLAIN A new breed of tools enable nonprogrammers to access even complex SQL databases through graphical, point-and-click interfaces. You can query a database, produce reports, generate graphs, and even perform statistical analysis functions—all without knowing a single line of SQL code299

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Mind games: Work your strategy skills with *Shadow President* (page 484).

New tool offerings from all the major SQL back-end vendors mean corporate developers can put easy-to-use GUI database apps on every desktop (page 237). For less sophisticated needs, nonprogrammable query tools give even novice users point-and-click access to SQL data (page 299).

The HP 4L isn't bad, but



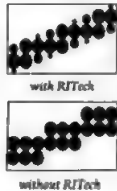
THE HP 4L



*There's only one
option on the HP 4L.
A memory upgrade
from 1MB to 2MB.*

The HP 4L is a good laser printer. Just limited.

it's no ActionLaser 1500.

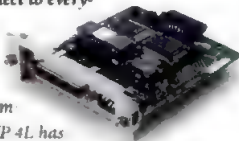


Epson's RITech (Resolution Improvement Technology) increases the ActionLaser's normal 300 dpi print quality to eliminate jagged edges right where you need it: in the curved lines of letters, numbers and images. And Epson's MicroArt printing technology gives you deep, dark blacks and incredibly fine lines.



The ActionLaser 1500's top speed is six ppm. That's seriously fast, fifty percent faster than the HP 4L.

The ActionLaser 1500 comes standard with parallel and serial interfaces that allow two users to share a single printer. Add another interface and a third user can share the same printer. The ActionLaser 1500 can connect to everything from PCs to IBM mini and mainframe computers. The HP 4L has one interface.



PCL 5 emulation is standard. The extra power of Adobe PostScript is a simple plug-in option. With HP, you have to buy another printer to get PostScript.



27 fonts (13 scalable) are standard. Should you expand your typographical horizons, unlimited fonts are easy to install via HP compatible plug-in cartridges, available anywhere. The HP 4L doesn't accept HP's cartridges.

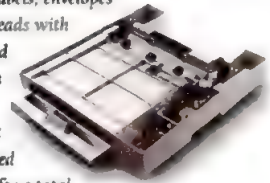


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PC Computing Best Buy. (June 1993.) The word is getting around. The Epson ActionLaser 1500 is the best choice in personal lasers.

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We welcome letters. However, we cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone. Send your written questions, complaints, and compliments to *PC Magazine*, One Park Ave., New York, NY 10016-5802. Please include a daytime telephone number. Send electronic mail to MCI Mailbox 157-9301, to CompuServe address 72241,104, Internet address 157.9301@mcimail.com, or to PC MagNet (see below). *PC Magazine's* general number is 212-503-5255. The West Coast Operations number is 415-378-5500.

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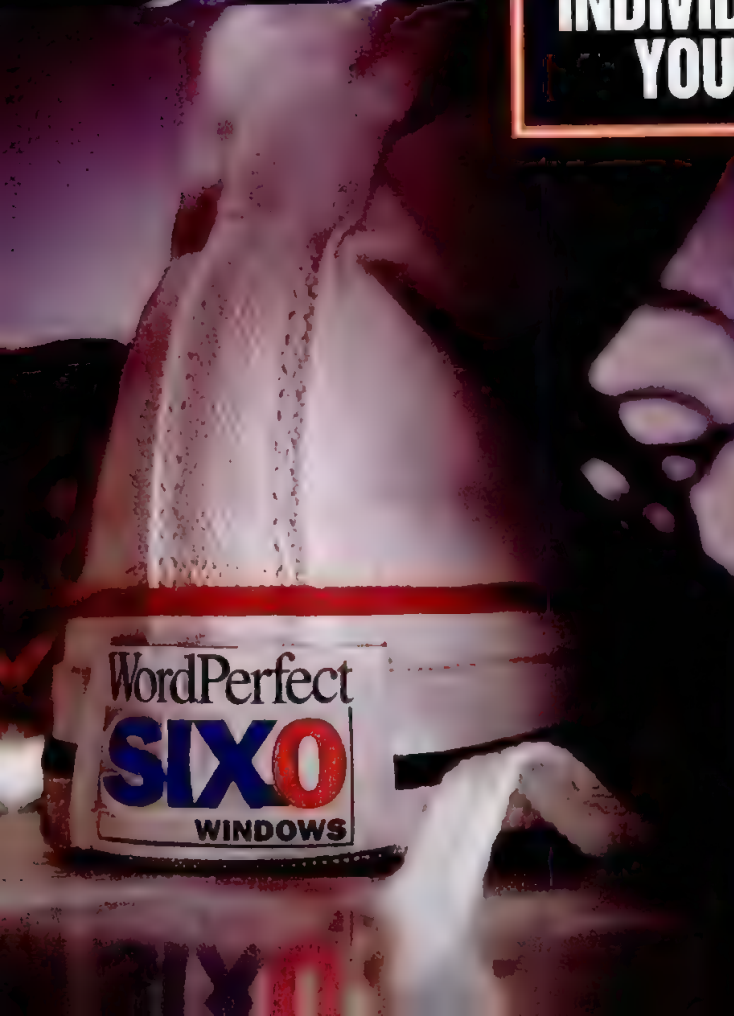
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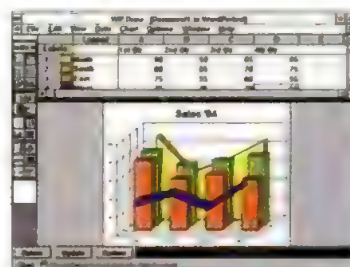
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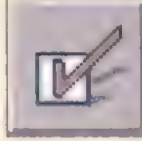
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In Mr. Magoo's case, what he can't see covers lots of territory. For the rest of us, it includes things like invisible electronic emissions.

The more electronic equipment you work with, the greater the concern. That's why some monitor manufacturers offer models with VLMF (Very Low Magnetic Field) features. And charge extra for them.

But not Samtron. We were among the first to offer VLMF on our monitors. And now we build it into every advanced monitor.

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The same can be said of our economical 14" color monitor (SC-428TXL). Both are VGA and VESA compatible.

As we said, they all come with VLMF. Plus something else worth looking for.

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Letters

SEEING THE WHOLE PICTURE

PC Magazine does not disappoint! After studying what I thought was an exhaustive review of 17-inch monitors in the September 14 issue ("A Wider View"), I made my choice. A new Nanao Flexscan F550i-W sits in all its glory on the corner of my desk. Its display is stellar. I wasn't sure if I needed a 17-inch monitor, but I took a gamble, and it has paid off.

John T. Somers
New York, New York

In your review of 17-inch monitors, September 14, the Samsung SyncMaster 5c received low marks based on the tests that PC Labs performed. In defense of Samsung, my company is using these monitors as X terminals, and we find their graphics characteristics to be excellent.

Peter Ghavami
Beaverton, Oregon

Thanks for covering 17-inch monitors in the issue of September 14, 1993. I'm particularly intrigued by the Flat Tension Mask (FTM) used by Zenith Data Systems. In my experience, no technology is better at reducing glare than FTM.

Ramer W. Streed
North Mankato, Minnesota

SPEAKING A DIFFERENT LANGUAGE

Your First Looks column, September 14, 1993, on WordPerfect 6.0 for DOS states briefly that the product's new macro language is similar to the one in WordPerfect for Windows, and that users will be required to rewrite complex macros. How right you are!

The change in macro language from WordPerfect 5.1 for DOS to WordPerfect for Windows is old news, as is the inadequate macro-conversion utility that came with WordPerfect for Windows. But I thought that would be the end of it. I thought WordPerfect 6.0 would use the same language as WordPerfect for Windows and have a better conversion utility. While the two languages are similar, WordPerfect 6.0 can't run WordPerfect for Windows macros, and there doesn't seem to be a conversion utility.



*No technology is
better at reducing glare than
Flat Tension Mask.*

You'd think with all the time they've had, WordPerfect would have gotten this macro business right.

Werner Buchholz
Wappingers Falls, New York

VERIFYING YOUR BACKUP

The September 14 comparison of backup utilities ("DOS 6 Utilities vs. the Competition: What's the Price of a Free Lunch?") left out a very important feature that seems to be missing from many backup utilities: verification. Central Point Software's PC Tools for DOS, Version 8.0a only verifies data after the entire backup is completed. The software that came with my Maynard QIC-80 tape drive verifies data one track at a time. I find this to be a very important feature.

Jim Corrigan
Salem, Oregon

In your review of backup utilities, September 14, 1993, you mention that Microsoft Backup in MS-DOS 6.0 won't restore backup disks made by the command-line backup program in previous versions of MS-DOS, and you suggest that users keep an old version of the MS-DOS Restore program. While it's true that the Backup program in MS-DOS 6.0 won't

restore such backup disks, MS-DOS 6.0 does come with a version of the Restore program that will restore such disks. It's still a command-line program, and the user has to supply parameters, but at least you don't have to worry about saving a previous version of Restore.

Jon Durbin
Los Angeles, California

USING CHKDSK

In the piece "Disk Cache: Performance vs. Safety," September 14, 1993, you recommend that users add the command CHKDSK/F to their AUTOEXEC.BAT file. While this is a good precaution when nothing goes wrong, I've found that it can be disastrous in certain situations. While it's most likely that a disk write will occur when writing a file, it may also occur when writing a directory sector. If the error occurs when writing a file, running CHKDSK/F will limit further loss, but running CHKDSK/F when a directory sector has been damaged will cause files to be truncated and mangled.

A better procedure would be to run CHKDSK to see if and how many errors are reported. Then run CHKDSK/F only if a few files have problem. If CHKDSK reports a screenful of errors, use something like Norton's DISKFIX.

Tim Lors
Spencer, Iowa

CONTACT MANAGERS

Remote Control International's Telemagic, a leading contact manager, was absent from your review "Contact Management: Keeping in Touch," August, 1993. I've been a PC Magazine subscriber for years, and the exclusion of Telemagic, a product with a huge installed base, leaves me puzzled.

Hakim Chishti
Endicott, New York

• The August review of contact managers was restricted to general-application products. In PC Magazine's opinion, Telemagic is a specialized contact manager, aimed specifically at the needs of sales personnel and telemarketers.—Ed.

Perhaps you'd like to consider a more rational approach to choosing a portable computer system.

*A*s any decision maker knows, making decisions is tough. Especially the big ones. At least we can make the job of choosing a portable computer system a little easier by introducing a rather remarkable item: the AST Bravo NB. It's compact, lightweight, and comes with local bus graphics for speed. An integrated trackball. Complete PCMCIA connectivity. Even dual scan color. In fact, the Bravo NB has most of the significant features found in other advanced notebooks, with one notable exception: Ours has a reasonable price tag. As it starts at \$1,699,* we'd understand if you lost your power of rational thought and acted impulsively. (Which is why we've included our phone number.)



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LETTERS

SURGE SUPPRESSORS REVISITED

Brooks Power Systems was shocked to read the false report in "Surge Suppressors: Cutting Surges Down to Size," *PC Magazine*, April 13, 1993, that the Brooks Power Systems Surge Stopper BPS-BN6-6 was constructed like the Perma Power RS-610.

PC Magazine reported that the Perma Power unit suffered from "poor construction," which created an electrical hazard, and alleged that the Brooks Surge Stopper was the "victim" of the same kind of poor construction. The "poor construction," to which you referred, in the Perma Power unit was insufficient insulation be-

***PC Magazine was correct
in 1986 in stating that
the Brooks Marketing
Surge Stopper AP6-6 was
excellent. That same
product is equally
excellent today.***

tween the outer case and inside printed circuit board, which created an electrical hazard. Had your writer examined the Brooks Surge Stopper, *PC Magazine* would have observed a completely different construction. The printed circuit board is locked into place by a combination of a metal stand-off attached to the bottom side of the board and two guides along the inner walls of the case. There is in addition an insulation barrier between the bottom side of the board and the outer case. This design is totally different from the Perma Power unit and is vastly superior.

Underwriters Laboratories, which has been in the business of testing products for safety for almost a century, has approved the Brooks Surge Stopper. UL has advised Brooks that the space between the printed circuit board and the

outer case is safe and that the space specification is equal to similar safe space specifications for other products that have printed circuit boards inside metal cases, such as computers, printers, and modems.

It should be noted that the Brooks Marketing Surge Stopper AP6-6, a unit made by our predecessor company and of identical design to today's BPS-BNS-6-6, was reviewed in the issue of May 27, 1986. There, *PC Magazine* approved the design and called the product "excellent." *PC Magazine* was correct in 1986 in stating that the product was "excellent." That same product is equally excellent today.

*Joseph G. Brooks
President, Brooks Power Systems
Bensalem, Pennsylvania*

The Brooks Electronics Surge Reactor BN6-6 is designed to maintain a sufficient clearance between the circuit board and the case to prevent arcing. We believe your article misrepresents our product as unsafe and unreliable. According to the article, passing units "let through less than 500 volts." Your performance test data indicates our Brooks Electronics Surge Reactor BN6-6 passed through 500 volts or less on every test. It should have been ranked as passing.

*Richard A. Jeffrey
Vice-President, Brooks Electronics
Philadelphia, Pennsylvania*

• *PC Magazine* did not report or mean to imply that either the Brooks Power Systems Surge Stopper BPS-BN6-6 or the Brooks Electronics Surge Reactor BN6-6 was identical in construction to the Perma Power RS-610. Our point was that in the judgment of ZD Labs the spacing between the circuit board and the case should have been greater in the models ZD Labs tested.

ZD Labs tested a number of samples of both the Brooks Power and Brooks Electronics surge suppressor models. One sample from each vendor produced acceptable results on all criteria, and those results were published. Other samples did not produce acceptable results. Because of the mixed results, we rated the Brooks Power and Brooks Electronics models "marginal."—Ed.

CORRECTIONS AND AMPLIFICATIONS

The correct toll-free phone number for information about Aldus Persuasion (reviewed in "Desktop Presentations: The Sound and the Fury," September 14, 1993) is 800-333-2538.

The capacity and pricing of the Micropolis Raidion disk array (reviewed in "RAID: Software-Based Options," September 14, 1993) were incorrect. The Raidion with RaidWare 2.0 software can expand to 32 modules with more than 93GB of storage. The price of a 1GB module is \$2,515, while the price of a 1.34GB module is \$3,160.

In the Editors' Choice sidebar for "Keeping Up with UPSs," September 14, 1993, we mistakenly gave Deltec Electronics Corp.'s Power-Rite Pro PRA600A credit for offering the longest backup operation. Deltec's product is still Editors' Choice for low cost, but Exide Electronics Corp.'s Powerware Personal Series Model 800 VA received Editors' Choice for performance.

In our cover story "Value-Line PCs: Family Values," September 28, 1993, some service and reliability ratings for vendors are reported incorrectly. Advanced Logic Research's technical support should be given as average, Gateway 2000's reliability and technical support as above average, Hewlett-Packard Co.'s reliability and technical support as above average, IBM's technical support as average, and Northgate's reliability as above average.

HOW TO WRITE TO PC MAGAZINE

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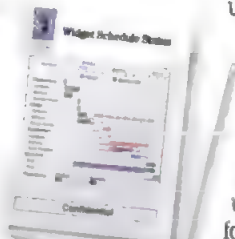
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—PC World, August 1993



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You know that 1-2-3® for DOS R3.4 is the fastest DOS spreadsheet ever. And you know its unique 3-D capabilities and SmartIcons™ make it the easiest DOS spreadsheet ever. So it won't be any surprise that 1-2-3 for DOS is also the most productive DOS spreadsheet — upgrading your current spreadsheet to 1-2-3 Release 3.4 will actually save you and your organization time and money. But don't take our word for it.

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1-2-3 for DOS offers exceptional ease of use plus a GUI that lets you squeeze more out of the DOS environment — without forcing you to

Payback Example:

Savings/user/5 yr.	\$2,150
Savings/user/1 yr.	\$430
Number of users	500
Annual Dollar Savings	\$215,000

upgrade your hardware. This adds up to an incredible return on investment.

In fact independent research from the Gartner Group demonstrates that the productivity enhancements of 1-2-3 for DOS Release 3.4 translate directly into money saved: you can expect gains in

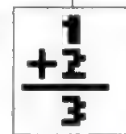


individual productivity in excess of 20%. And a return on investment of 330%. In the first year.*

For example, a corporation with 500 users would spend about \$59,500 to upgrade to 1-2-3 Release 3.4. Based on a productivity model which considers the cost of training and support, this corporation would save over \$200,000 annually in support costs as a result of the upgrade. No matter what size your company is, upgrading to 1-2-3 R3.4 will save you money and increase your productivity.

THE FASTEST, EASIEST DOS SPREADSHEET GIVES YOU THE BEST RETURN ON INVESTMENT.

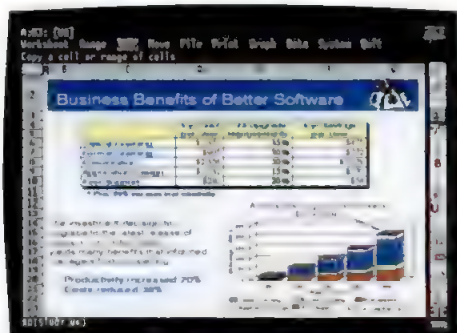
It just makes sense. First, 1-2-3 Release 3.4 has significantly increased the speed of key functions like product load, print, display and recalculation. And R3.4 prints faster, calculates faster, moves blocks of data faster and cuts file retrieve time practically in half. You save time. And time is money.



RADING TO 1-2-3 FOR IN TERMS EVEN YOUR ILL APPRECIATE.



But we understand it's not enough
that it's fast. It's got to be easy. **1-2-3**
Release 3.4 offers the most advanced



*The productivity and ease-of-use features of 1-2-3 for
DOS give you increased productivity and an excellent
ROI—without any change in your hardware.*

ease-of-use features of any DOS
spreadsheet. More than 90 SmartIcons
let you access your most commonly

used commands with a single click.
And because SmartIcons are so easy,
users become proficient more quickly,

without costly training support —
another way upgrading saves
you money.

And 1-2-3 Release 3.4 is the
only true 3D spreadsheet for DOS
— **3D worksheets increase produc-**
tivity by letting users work much
more efficiently with large spread-
sheets. Release 3.4 also offers

innovative features like DataLens® for
external database access, which makes
working with outside databases much

quicker and much easier. Plus 1-2-3
R3.4 is fully compatible with earlier
releases of 1-2-3 across platforms.

**SAVE MONEY
TOMORROW. 50% OFF
YOUR NEXT LOTUS
SPREADSHEET UPGRADE.**

Purchase your 1-2-3 for DOS —
either R2.4 or R3.4 — before December
31, 1993 and get 50% off your next
1-2-3 purchase — 50% off any up-
grade to 1-2-3 for DOS or Windows.**
This is our way of demonstrating our
confidence that Lotus® 1-2-3 is
your spreadsheet solution — today
and tomorrow.

Just visit your Lotus Authorized
Reseller or call **1-800-TRADEUP,**
ext. 9059 to take advantage of this
special offer.*** Or ask for your free
demo disk and White Paper, 'Business
Benefits of Better Software.' An incred-
ible return on investment today and
a great offer for tomorrow.

Lotus
Working Together®

INTRODUCING THE ONLY ANTIVIRUS SOFTWARE THAT WON'T BE OBSOLETE BY THE TIME YOU FINISH READING THIS AD.



The Brachiosaurus.
Was it a giant meteor? Global cooling? Who knows what finished this guy off. In any case, he was positively passé by the end of the Mesozoic era.



The Ford Edsel.
"Out" even before it was "in." Apparently, the saying that everyone enjoys 15 minutes of fame doesn't apply to the automobile kingdom.



Typical Antivirus Software.
Needs to be updated every month. Useless against the three new viruses coming out each day. Almost as technologically advanced as a Slinky.

It's called Norton AntiVirus™ 3.0 (NAV) for Windows and DOS. It has a brand new Windows interface that makes it easier to use and configure. And it makes other antivirus software look as up-to-date as the leisure suit.

That's because it fights both known viruses and new ones that come out every day. So you don't need to keep raiding your wallet to update your protection, something you'd have to do with other products.

Here's how NAV works. First, it scans your files for known viruses - it recognizes over 2,000 of them. Once discovered, they're automatically eliminated from your system.

Next, NAV takes care of unknown viruses, something that most other software can't do. Using our patent-pending Symantec Novi Virus Sensor Technology, NAV runs rule-based integrity checks to compare current file characteristics with a snapshot stored in RAM before the program is executed. When it notices viral activity, it instantly kills it. NAV also repairs damaged file areas before the virus can complete its dirty work.

For even further protection, NAV

alerts you to changes being made to your files — by some anonymous virus, for example. Bad news for even the most clever viral code.

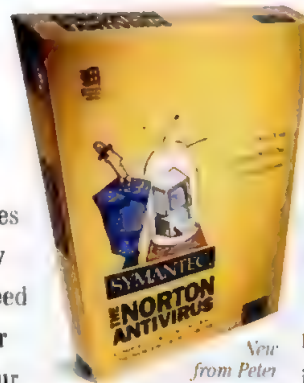
And because NAV scans for viruses faster than any other software, you'll never feel tempted to deactivate the scan to avoid waiting. Plus, you can schedule automatic scans for times when you're not using your computer.

NAV also comes with a network installer* for remote installation, requires very little memory space, and is even available to you in a Netware Loadable Module (NLM) version.

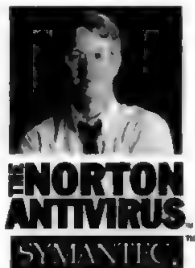
As if all this weren't enough, NAV is both a PC World Best Buy and a PC Magazine Editor's Choice for March '93. So there you have it.

If you'd like more information (via fax) about the only product that can offer you total, up-to-the-minute antivirus protection, please dial 1-800-554-4403, select option 1 and request document 449. Then go ahead and put that other antivirus software where it belongs.

Upstairs in the attic with your prized collection of disco records.



New from Peter Norton, the biggest name in virus protection.



Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET

PowerPC Chip Moves In

Will it replace your 486?

A decade after IBM and Apple established incompatible desktop computing standards, they signed a historic peace treaty in 1991. They agreed, along with Motorola, to jointly develop a RISC-based processor, called PowerPC, on which future IBM and Apple

machines would be based. IBM recently shipped the first computer to use the PowerPC chip. PowerPC will consist of a family of chips beginning with the 601, which the alliance claims costs less, performs better, emits half the heat, and measures half the size of Intel's Pentium processor. More family members are expected in 1994: The 603 chip will be low-powered for use in notebooks, and the 604 will be more powerful than the 601. PowerPC's first 64-bit processor, the muscular 620, should be available by the end of next year.

IBM's first PowerPC-based system, the POWERstation/POWERserver 250, is not a Pentium killer but an addition to IBM's workstation line. This isn't surprising, since the roots of PowerPC's architecture are firmly planted in IBM's RISC technology. Like the workstations it replaces, the 250 runs a version of Unix and has a Micro Channel architecture (MCA) bus. The system competes with RISC-based Unix workstations from Digital Equipment Corp., Hewlett-Packard, Silicon Graphics, and Sun Microsystems; it will run DOS and Windows applications in emulation.

The first Pentium killers won't appear until another camp in IBM, the Power Personal Systems division, ships its first 601 system in 1994. IBM will show a preproduction unit at this November's Comdex show in Las Vegas.

Apple plans to migrate its systems from Motorola 68000-series processors to the more powerful PowerPC beginning the first half of next year. Using emulation technology, Apple guarantees that today's applications will run on the new Macintoshes.

PowerPC systems will not appeal to the 486 and Pentium crowd until popular operating systems and business applications are available on the new machines. IBM plans to have a new version of OS/2 available for PowerPC in the distant future, and sources say that Motorola is working to port Microsoft Windows NT to PowerPC. Taligent's object-oriented operating system (code-named Pink), another part of the Apple and IBM truce, will run on PowerPC. For the time being, there are no predictions as to when the system will be available.

—Christopher Barr

ISO What?

AS JARGON GOES, THE WORD *ISochronous* (emphasis on "sock") sounds like a theory that physicist Stephen Hawking would write about. Instead, it's a new networking technology that may allow video conferencing across an Ethernet LAN—without bringing the network to its knees.

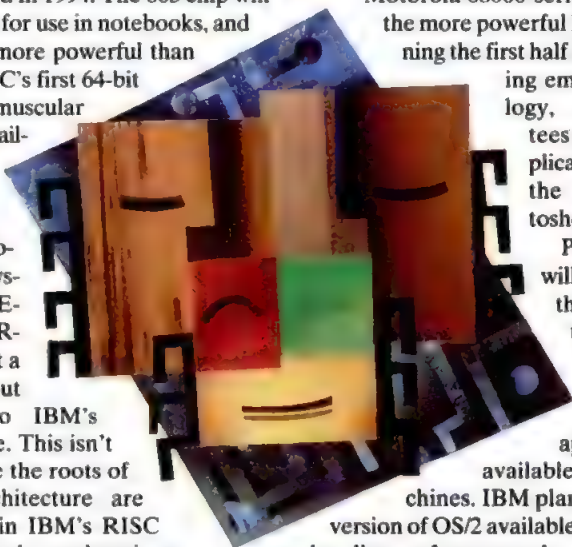
Isochronous Ethernet, or IsoEtnet for short, is being promoted by National Semiconductor as an inexpensive alternative to more powerful networking standards due in the next few years, such as Asynchronous Transfer Mode (ATM) and 100-Mbps Ethernet. IsoEtnet is being trumpeted by its inventor as the best way to send video across the network because each end of an isochronous link is connected by a synchronized channel.

An IsoEtnet connection begins with a call from one node on a network to another requesting a clear connection. Once established, video and audio can then be transferred synchronously at up to 16 Mbps (more than Ethernet's 10-Mbps) as long as no other nodes simultaneously use the network.

National Semiconductor claims the 16-Mbps data rate is fast enough to conduct synchronized video conferencing at 20 to 30 frames per second (fps). Ordinary packet-switched Ethernet can get bogged down at 7 to 10 fps, at which point voice and video appear to lose lip synchronization.

The desire for greater networking bandwidth is nothing new, and there are a number of alternatives. Ethernet switching-hub technology doubles the bandwidth of existing Ethernet LANs by letting them send and receive at the same time. Fast Ethernet, a proposal that increases the bandwidth up to 100 Mbps, is coming on strong, as is ATM. But National Semiconductor claims that its rivals fail to provide the guaranteed bandwidth for video.

National Semiconductor expects that many companies will want to run multimedia and video conferencing applications over existing networks. At a fraction of the cost of an ATM network, isochronous networks could provide a low-cost alternative. But it's not no-cost—you'll still have to buy new adapters and hubs.—Christopher Barr



Pipeline *By Robin Raskin*

Suite Deals for End Users

The difference between buying a software suite versus buying a standalone application used to be clear cut. Buying standalone apps let you get the best of breed in each category; suites offered convenience and price. Today, suites are more than just the heaviest boxes (suitcases, as we call them) at the lowest prices.

While Lotus SmartSuite and Microsoft Office are duking it out for market share, Borland and WordPerfect, neither of which has the breadth of products to compete, have collaborated to launch Borland Office for Windows 1.0. The product marries Borland's Paradox for Windows and Quattro Pro for Windows to WordPerfect 5.2 for Windows. Graphics companies such as Aldus and Micrografx are also offering suite collections.



What are the advantages of a suite? A suite appeals to the price sensitive. With Lotus SmartSuite, Release 2.1 for Windows, for example, you're getting the equivalent of two apps for free if you price each component individually against the suite price of \$795. (The \$299 promo runs until the end of the year.)

Suites also establish an interapplication standard for menu and interface—very appealing to the corporate buyer. When apps have a common look and feel, the learning curve flattens. Finally, there's the perception that apps might work well together because they come from the same maker.

The new suites from Lotus and Microsoft work fiercely to create an "integrated" advantage for buyers. This fall, Microsoft's new Office, Version 4.0., will carry a retail price of \$750. It'll include Word 6.0 and Excel as well as PowerPoint and a workstation license for Microsoft Mail. There are coupons for a free upgrade to Excel 5.0 and the new PowerPoint. A superloaded version of the suite, called Office Pro (\$949), adds Microsoft Access. Excel 5.0 will include Visual Basic for Applications, a macro language that lets you develop quick but robust custom apps that work together. And most important is the inclusion of OLE 2.0 apps, which means that you can work in a document and edit objects from the spreadsheet, graphics, or other apps, without leaving the framework of that document.

The new Lotus SmartSuite, Version 2.1, is also a killer: Ami Pro 3.01, the new 1-2-3, Release 4, a revamped Organizer, a slightly upgraded Freelance Graphics, and the newest Lotus acquisition, Approach 2.1. As the Approach database goes into the box, cc:Mail comes out. There's some tight integration here, too. Using the included Bonus Pack, Ami outlines can automatically generate Freelance presentations, an inserted spreadsheet maintains all the styles of 1-2-3, Release 4, and more. The products share a single dictionary, smart icons, and other code. The SmartSuite has some clever ties to Lotus Notes. Freelance, for example, uses Notes to house a database of slide presentations on the network.

Undoubtedly, the pendulum will swing again. Trends toward standalone or suites of apps, are, after all, trends. But 1993 looks like a suite year.

Robin Raskin is an executive editor of PC Magazine.

Do You Need A PDA?

IF YOU FOLLOWED THIS SUMMER'S Doonesbury series lampooning Apple's Newton, the answer is an unqualified NO! But if you consider the tremendous development efforts now underway to bring business applications to personal digital assistants, you may think differently.

Over the next several months you can expect the arrival of industry-specific PDA software designed to replace the traditional pen, paper, and clipboard in fields such as health care, restaurant, retail, banking, finance, and realty.

This is a practical evolution, predicated on plenty of cooperation between hardware and software developers. "We see mobile computing opportunities in vertical applications markets. The money is there, as is the interest," says Ann Marie McGee, product manager of Fujitsu's PoquetPad Plus.

Consulting firm KPMG Peat Marwick has launched Newton Solutions, an umbrella program for developing PDA technolo-

gies. ProMED is its first product. Due in December, this hospital management application is designed to expedite the flow of clinical information through a bidirectional interface between the physician's Newton and the hospital's central system. A Unix server will access the information, acting as the liaison between the two systems.

The roster of upcoming Newton apps targets a broad range of professions. Teachers will use Chancery Software's CSL Profiles in Hand to take notes on student performance. Accountants and consultants will have Great Plains Software's Personal Time & Billing to keep track of billing hours, and to upload data from any location. Frequent business travelers will consult GeoSystems' Fodor's 94 Travel Manager, Top U.S. Cities, for travel information as well as Strategic Mapping's GeoAssist for

street maps, access to the on-line Dunn & Bradstreet Business Database, and a nationwide on-line telephone directory. PenMagic Software has teamed up with Money to produce Money Magazine Business Forms. And with Sulcus Hospitality's Squirrel Restaurant Management System and the PoquetPad Plus in hand, waiters will take tableside orders and transmit them via radio wave to the kitchen.

Let's just hope Doonesbury doesn't hear about this one.—Melissa J. Perenson



Digital Computing Takes Flight

WHILE THE DEBATE RAGES OVER the potential dangers of using notebook PCs in flight, the airborne telephony industry is proceeding apace with in-flight computing services. Claircom Communications, GTE Airfone, and In-Flight Phone Corp. are now installing digital air-to-ground networks that will enable passengers to plug notebooks into armrest jacks to transmit faxes and e-mail, log into on-line services, and connect to office PCs.

Digital systems offer more reliable data

transmission than the analog systems in air-phones today: error-correction codes compensate for data lapses, and encoded sound remains unaffected by radio-wave signal degradation.

All three companies transmit via radio waves. A coder/decoder located in the handset or armrest digitizes analog data, which is then carried to an on-board PC-based Cabin Telecommunications Unit (CTU).

The CTU directs a switching mechanism that passes the digital information to the airborne radio and to ground stations, which, in turn forward it into the telephone network.

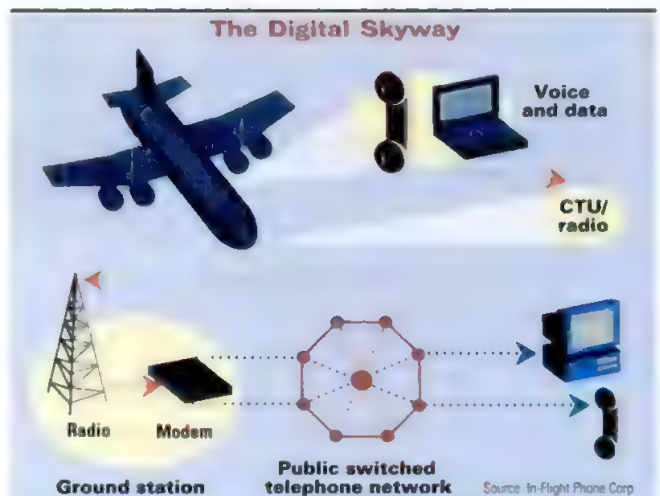
The digital skyway will run in two directions. Both In-Flight and GTE are providing ways for passengers to receive incoming phone calls, e-mail, and faxes.

USAir's fleet is now being equipped with In-Flight's FlightLink, which transmits data at 9,600 bps at a cost of \$2 per minute. Modems at the ground stations eliminate the need for internal modems; data is transmitted via a special cable from the serial port to an RJ-12 phone jack in the armrest. Once groundstations are equipped with Class 2 fax/modem hardware, passengers will be able to send faxes using commercial fax software, says Dr. Marvin Schwartz, chief technology officer at In-Flight.

By December of this year, GTE's GenStar voice, fax, and data network will be transmitting data at 2,400 bps from the domestic fleets of United and Delta airlines as well as from some of United's international fleet. Passengers can plug notebooks directly into an RJ-11 phone jack built into a phone handset. Claircom's AirOne network will handle 4,800-bps fax/data transmission via an RJ-11 jack on all American, Northwest, and Southwest planes.

Long-term plans for in-flight telecommunications include Claircom's proposed Cellular Digital Packet Data (CDPD) link that would allow passengers to transfer data at 19,200 bps. And In-Flight is working on V.42bis data compression for 38,400-bps air-to-ground transmission.

All three systems can send signals to satellites so that transoceanic travelers can stay connected.—*Melissa J. Perenson*



Colorful Future For Pen Systems

BRILLIANT ACTIVE-MATRIX LCDS have been showing up on notebooks for nearly two years, yet active-matrix pen systems have yet to be introduced. New digitizer technology from Kurta, MicroTouch, and Scriptel will make pen systems just as colorful as their notebook cousins.

A digitizer translates analog pen strokes, motions, and scribbles into digital 1s and 0s. Although there are many digitizing methods, digitizers that use untethered pens are probably the most popular. Both electrostatic resistive and electromagnetic digitizers use electrical impulses to detect the pen's position.

Pen computers with active-matrix color panels have not been available because active-matrix color LCD panels, which have more than 900,000 transistors embedded into the display, generate electrical "noise" that interferes with the digitizers. Monochrome panels don't create nearly as much interference. To be effective, digitizers must be accurate to within a half a pixel over the entire screen, including near the edge of the display.

Kurta, MicroTouch, and Scriptel, companies that currently make standalone digitizers for CAD/CAM and precision-graphics applications, have recently overcome the noise problems. While many color pen systems based on the new digitizers are expected sometime next year, NEC Technologies will ship an active-matrix color version of the VersaPad before the end of this year. Pen computers are only a start, however. These same digitizers can be used on the 21-inch gas-plasma displays also expected next year.—*Christopher Barr*

Top Retail Software

Current ranking	Last issue	Product/company
1	3	Microsoft Windows 3.1 Microsoft Corp.
2	—	Microsoft Publisher 2.0 Microsoft Corp.
3	12	Procomm Plus 2.01 Datastorm Technologies
4	15	Lotus 1-2-3, Release 4 for Windows Upgrade Kit Lotus Development Corp.
5	10	Procomm Plus for Windows 1.02 Datastorm Technologies
6	1	Quattro Pro 5.0 for Windows Borland International
7	7	QEMM 7.0 Quarterdeck Office Systems
8	4	WordPerfect 6.0 for DOS Upgrade Kit WordPerfect Corp.
9	13	Microsoft Office for Windows 3.0 Microsoft Corp.
10	8	Delrina WinFax PRO 3.0 Delrina Technology
11	6	WordPerfect 5.2 for Windows WordPerfect Corp.
12	—	QuickBooks 2.0 for Windows Intuit
13	—	WordPerfect 6.0 for DOS WordPerfect Corp.
14	5	Microsoft Access for Windows 1.1 Upgrade Kit Microsoft Corp.
15	—	Microsoft Excel 4.0 for Windows Microsoft Corp.

This list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending September 4, 1993. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market.

Sales information compiled by Ingram Micro.

Briefs

NOT BELOW 10,000 FEET, SAYS A FEDERAL

Aviation Administration advisory circular on the use of notebook PCs on airplanes. "Until a study categorically proves that notebooks do, in fact, cause interference and under what conditions, there is no complete moratorium as long as the pilot in command determines that use of these devices will not cause interference," says Milton Hile, Jr., avionics specialist at the Federal Aviation Administration.

NOW THAT PRESIDENT CLINTON HAS LIFT-

ed the tariff on active-matrix LCD panels manufactured in Japan, companies such as Texas Instruments, NEC, and Toshiba are bringing assembly jobs back to the U.S.

NARROWING THE TRADE GAP? THE COM-

puter industry is flourishing in Eastern

Europe, reports the United States Department of Commerce. Last year, U.S. firms exported \$107 million in circuit boards, monitors, software, and printers to the eastern marketplace. The Eastern Europe Business Information Center in Washington, D.C. helps businesses export to and invest in this emerging market. Call 202-482-2645; Flashfax, 202-482-5745.

LOSING TRACK OF SOFTWARE AND MIS-

managing PC resources cost businesses and government more than \$20 billion a year, says the Personal Computer Assets Management Institute. Conducting regularly scheduled hardware and software inventories, monitoring software usage, and standardizing configurations can help to effectively allocate resources and minimize productivity loss.

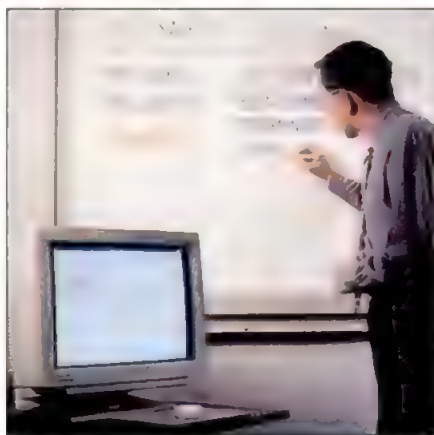
—Carol Levin

the forefront with LiveBoard (\$49,500), a 3- by 5-foot backlit active-matrix LCD powered by an Intel 486 processor. Essentially a large, interactive computer, LiveBoard has a modem so people in different locations can edit the same document simultaneously.

Wacom's Meeting Staff (\$5,677) is a 5- by 3-foot digitizer that connects to a PC through a serial port. A grid of wires below the surface rapidly alternates between transmit and receive modes so images instantly appear on the PC monitor and are sent via modem to remote PCs.

Microfield Graphics' SoftBoard (\$2,995) takes a simpler approach by using magic markers with bar code sleeves. Two lasers constantly scan the board's surface and read the bar codes to determine position and color of the markings.

Electronic whiteboards can save companies money that would be spent on transportation. "This shared space is critical to unite workgroups that would otherwise have to travel to meet effectively," says Xerox's Bruce.—Tin Albano



Electronic whiteboards like the SoftBoard let people in multiple locations share visuals.

3-D Whiteboards

ENTERING A VIRTUAL conference room from your PC is becoming more practical now that videoconferencing products from AT&T, IBM, Intel, and Northern Telecom are available. But another technology is bringing together far-flung meeting participants with a much smaller investment: electronic whiteboards.

These whiteboards enable people in remote locations to collaborate on a document as naturally as if they were all in a conference room jotting ideas on a conventional whiteboard. Used with a speaker phone, it can be a productive tool for remote workgroups.

The focal point of this concept is the *shared document*. "Lots of videoconferencing time is spent watching your coworkers read faxes you just sent them. That's not productive," says Richard Bruce, president of Xerox's Group Communications. Xerox is at

Wharton in a Box

WHAT IS MBA-WARE, AND CAN YOU really use it to run your business and help it grow? The Management Software Association, a Brookline, Massachusetts-based nonprofit consortium of 11 developers in this newly created software category, is promoting the premise that software other than spreadsheets can be used to help meet business and management challenges.

The MSA defines MBA-ware as software that enables managers to draw upon business theory and management expertise in solving problems and that can analyze and advise, not just manipulate data. "Companies that aren't incredibly sophisticated in computers find MBA-ware a turnkey tool to help them better manage their businesses," says Norman Wu, president of Avantos Performance Systems.

All the vendors involved are quick to point out that their programs aren't simply business books transferred to disk. Imagine a mix of project management programs, rules-based expert systems, and forecasting software and you start to get an idea of what MBA-ware is all about.

Included in the group are vendors like Avantos (510-654-4600), whose ManagePro 2.0 (see First Looks in this issue) encourages managers to set goals and track progress for themselves and their subordinates. Traditional algorithm-laden forecasting packages like Business Forecast Systems' ForecastPro (617-484-5050) and Smart Software's Smart-Forecasts (617-489-2743) are also members.

Beacon Expert Systems (617-738-9300) has NegotiatorPro, which teaches the art of negotiation and advises decision makers through difficult negotiations. Experience in Software (510-644-0694) has three programs covering negotiation, project planning, and idea generation. Imagine That Inc. (408-365-0305) produces Extend, which lets managers carry out "what if" analysis on simulated business systems.

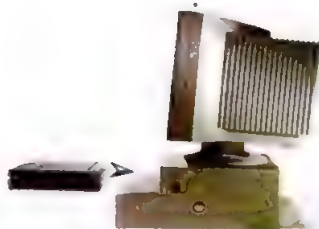
Managers themselves will have to decide whether these programs can handle specific business problems, but one thing's for sure: they're cheaper than two years in Business school.—Don Willmott

TRENDS PLUS

From October 11 to October 15, you can download a demo of ManagePro and discuss MBA-ware with developers. Just type GO ZNT: EXEC from any Compu-Serve prompt.

 **It sits,
lies down,
and does
back
flips.**

Good b



oy.

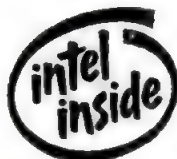


*The UltraLite® Versa® notebook
gives new meaning to the term
"faithful companion."*

*Versa functions as a pen-
based tablet to enter
notes or data.*



*The reversible screen
makes presentations
a snap.*



The UltraLite Versa is truly a breed apart. It's versatile and adapts easily to meet your changing needs, whatever and wherever. For example, switch from a mono to color screen, or put in more hard-drive memory. And despite its heavy-duty technology, the Versa weighs as little as 6 pounds.

Then there's the most sophisticated and flexible display on the market. Use it as a basic notebook, flip it around for presentations, or use it as a pen-based tablet. Plus, Versa's screen provides sharp contrast and brilliant graphics, monochrome or color.

With up to 10 hours of battery life, the one thing it won't do is play dead.

Yes, the Versa notebook knows a lot of tricks. Its i486™SL processor is fast and powerful, yet conserves power. Simply swap the floppy drive for an extra battery, doubling battery life.

And what's a notebook computer if you can't take it for long walks? Advanced PCMCIA communications capability means you can easily send and receive faxes and retrieve data.

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In addition to a standard 3-year limited warranty, you get UltraCare™, an enhanced, full-service program providing fast response and support anytime, anywhere, at home or overseas.*

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Trakker 120 (120 MB capacity, using data compression) is the price leader. And Trakker 250 (250 MB capacity using data compression) is the fastest in its class at up to 8 MB/minute. Both give you QIC Industry Standard Recording Format, as well as Novell® and LANtastic® certification.

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CIRCLE 073 ON READER SERVICE CARD

First Looks

HANDS-ON EVALUATIONS OF THE NEWEST SHIPPING PRODUCTS

■ A Stellar Notebook Gets Recharged

IBM's ThinkPad 750C: A Good Thing in a Lighter Package

BY BRAD GRIMES

If there's one division in the new IBM that can pull the computer giant back from the brink of disaster, it's the Mobile Computing group of the IBM Personal Computer Co. The four models in the new ThinkPad 750 family are remarkable. Each is built around an Intel 33-MHz 486SL processor, but each is targeted at a slightly different user and price point.

You can choose among the monochrome ThinkPad 750, the active-matrix color ThinkPad 750C, the pen-convertible ThinkPad 750P, and the soon-to-

be-released dual-scan color ThinkPad 750Cs.

We evaluated one of the first active-matrix color models to come off the line. \$4,699 isn't an unreasonable amount to pay for the industry's only 10.4-inch active-matrix color display, the innovative TrackPoint pointing device, a 170MB hard disk, 4MB RAM, a 2.88MB floppy disk drive, and a Type III PCMCIA slot. But the ThinkPad 750C's feature list extends even further.

Like all ThinkPad 750s, this model has an integrated 16-bit stereo audio subsystem and a high-fidelity speaker, plus input/output jacks for microphones, headphones, or portable speakers. The unit we saw was also configured with IBM VoiceType Control, a rudimentary speech recognition software program that gives you voice control over basic commands under Microsoft Windows.

You might expect to give up



LESS IS MORE:

The 750C is a pound lighter than its predecessor.

performance in order to get such a feature-filled notebook, but the ThinkPad 750C consistently surpassed the average benchmark test scores for 33-MHz 486DX-

Continues on page 38

■ Another Mac Favorite Comes to Windows

\$399 Canvas: Illustration Without Hassles

BY LUISA SIMONE

Deneba Software's Canvas for Windows 3.5 bridges the gap between low-cost and high-powered drawing programs. At a price of \$399, you wouldn't expect this program to compete with big guns like CorelDRAW and Micrografx Designer, but in many ways it does.

Canvas distinguishes itself with the unique ability to edit bitmapped elements side by side with vector objects. Admittedly, Canvas's painting functions are extremely basic. A small floating palette contains rudimentary tools such as a paintbrush and a spray can. But even these simple tools make it possible to integrate bitmapped pictures into a layout more precisely and more efficiently. For example, using the Objects Specification dialog box you can change the size of a picture without degrading qual-

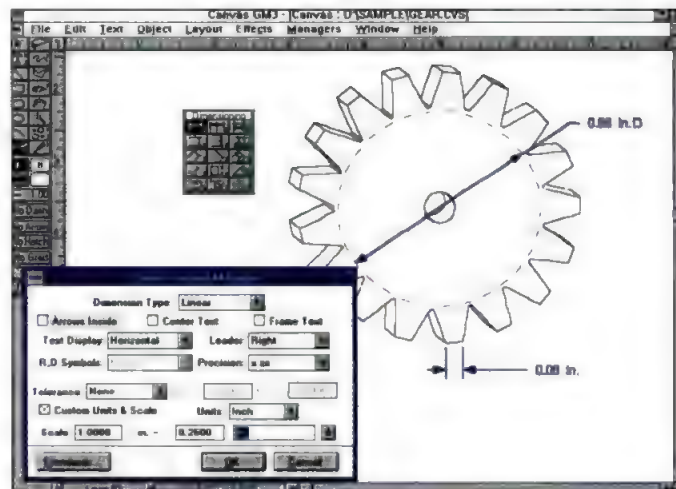
ity, because Canvas lets you increase or decrease the resolution or bit-depth as needed.

GETTING TECHNICAL

Technical illustrators will love the program's collection of specialized drawing tools. Canvas

has no fewer than 15 different dimensioning lines, each one of which can be customized with labels, scaled units of measure, and precision levels that vary from whole integers to four decimal places. So in addition to the

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MEASUREMENTS: Canvas provides control over dimensioning.

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First Looks

IBM Think Pad

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based notebooks. The 750C's scores on the Video and Graphics Winmark tests were especially impressive, and its battery life of almost 3 hours was a pleasant surprise considering the system's active-matrix display.

IBM has been able to shave about a pound off the weight of the 750C compared with its predecessor, the 720C. The 750C weighs just under 6.5 pounds with its floppy disk drive installed (5.9 pounds without it). An extra battery adds less than a pound to the travel weight, and the AC adapter is one of the smallest designs ever to fit in a carry-on.

If active-matrix color matters less to you than the money you need to spend to get it, the passive-matrix, dual-scan color ThinkPad 750Cs should be out soon. It's configured the same as the 750C except for the display technology, and it costs \$3,899 with a 170MB hard disk and 4MB RAM.

UPGRADE NOW OR LATER

The ThinkPad 750C and the rest of its family are a study in upgradability. The keyboard on every 750 pops up so you can access the removable hard disk, the nickel hydride battery, and the floppy disk drive. You don't have to pry the keyboard open; it tilts up easily and then snaps back into place when you close it. Below the floppy drive bay is a DRAM memory card slot for upgrading the system's memory to 20MB.

If you want to cut down on travel weight, leave the floppy disk drive at home; if you want several workers to share a single ThinkPad 750, they can each have their own hard disk; and if you need to swap batteries, you

The IBM ThinkPad 750C consistently outperformed the average 486DX/33-based notebook computer. It performed especially well on the video and Graphics Winmark tests. Its battery weighs less than a pound and has exceptional longevity for an active-matrix color notebook battery.

We used PC Magazine Labs' Hardware Benchmark Tests, Release 7.1, to measure the IBM ThinkPad 750C's processor, memory, video, and disk subsystem performance. The DOSmark is a composite rating derived from these four scores. The Graphics Winmark is based on ten Windows graphics and text functions

Higher scores represent better performance					Lower scores represent better performance		
Processor (operations per second)	Memory (kilobytes per second)	Video (millions of operations per second)	Disk (kilobytes per second)	DOSmark	Graphics Winmark (megapixels per second)	Battery Run-down (hours: minutes)	ZDigm Run-down (hours: minutes)
IBM ThinkPad 750C	7,420	5,325	3,828	29.70	27.82	3:07	4:35
486DX/33 average	6,963	4,997	1,999	26.04	2.80	2:08	2:47

don't have to power down the computer.

In the early part of 1994, IBM expects to introduce the ThinkPad CDPD (cellular digital packet data) Mobile Communication Module, which you can insert in the ThinkPad 750's floppy drive bay to give you wireless telephone, fax, and e-mail capabilities. Also around that time, IBM will ship the ThinkPad TV Tuner Module, which will give you on-screen television and VCR play-

back capabilities. IBM has released the specifications for its floppy drive bay in the hope that third-party vendors will develop other modules for the ThinkPad 750 series.

ThinkPad Dock I, which comes with two built-in stereo speakers, a drive bay that accommodates either a CD-ROM drive or a hard disk, an additional SCSI port, and a 16-bit ISA slot. The ThinkPad Dock replicates all the standard ports of the notebook PC. It doesn't require much extra space on your desktop because you attach your ThinkPad 750 on top of the docking station instead of sliding it into something that resembles a desktop PC. The ThinkPad Dock is also fully portable, weighing just 6 pounds (without a CD-ROM drive), and features a built-in handle.

IBM is offering the IBM Traveling Multimedia system, which combines a ThinkPad 750C (12MB RAM and a 340MB hard disk) with a ThinkPad Dock I and an internal CD-ROM drive for \$8,599. Also shipping with the Multimedia system is a PCMCIA 14,400-bps data/fax modem card, a carrying case, and an assortment of software that includes Asymetrix's Compel and Media Blitz!, Traveling Software's Lap Link V, and Delrina's WinFax PRO.

SERVICE AND SUPPORT

IBM supports ThinkPad 750 users with a three-year warranty, a 30-day money-back guarantee, and 24-hour, seven-day-a-week toll-free technical support. Through the IBM EasyServ program you can send in your ThinkPad 750 for service free of charge, and for a reasonable \$40 per year you can purchase on-site service.

The ThinkPad 750 family is

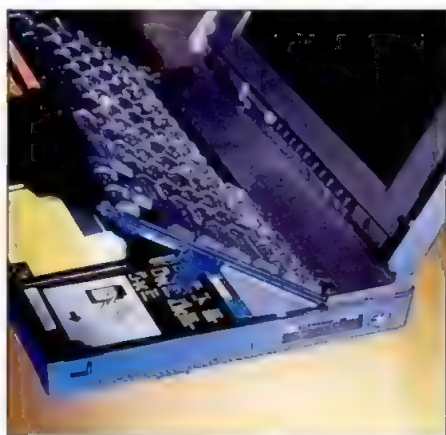
in a class of its own. We've yet to see another vendor produce a system with a display the size of the ThinkPad 750C's 10.4 diagonal active-matrix display, and the keyboard-based TrackPoint still stands alone as an innovative, efficient pointing device. And now the ThinkPad 750 family incorporates serious multimedia capabilities.

IBM also has a number of upgrade offers. One will turn a monochrome Model 750 into a 750C color unit, and another will turn a monochrome 750 into a pen-computing ThinkPad 750P. With the latter upgrade installed, you can then simply swivel the screen so that it lies, face up, on the computer, and write.

The question is, will you be able to buy one? Previous versions of IBM's ThinkPad were so popular that IBM scrambled to fill the backlog of orders, and the volume of calls to IBM and its dealers requesting a ThinkPad 750 is equally large. But if you act now and wait a while, you'll eventually reap the fruits of your patience.

• List price: *IBM ThinkPad 750C, with 4MB RAM, 170MB hard disk, IBM DOS 6.1, Prodigy*, \$4,699; *IBM ThinkPad 750P, with 4MB RAM, 170MB hard disk, PenDOS, Windows 3.1, Windows for Pen Computing*, \$3,749; *IBM ThinkPad 750 with 4MB RAM, 170MB hard disk, IBM DOS 6.1, Prodigy*, \$3,199. *IBM Personal Computer Co., Rte. 100, Somers, NY 10589; 800-772-2227; fax, 800-426-4329.*

Circle 439 on reader service card



UNDER THE HOOD: A pop-up keyboard makes upgrading the ThinkPad easy.

MULTIMEDIA DOCKING STATION

The ThinkPad 750 family brings with it a new docking station. To fully utilize the 16-bit audio subsystem in the new ThinkPad, IBM has introduced the \$899

Canvas

CONTINUED FROM PAGE 37

standard horizontal, vertical, and diagonal dimension lines, Canvas can indicate the radius or diameter of a circle and the number of degrees in an angle. The one shortcoming to Canvas's implementation of dimension lines—the fact that they are not associative—is easily overcome by grouping the dimension line with the object it measures.

While most drawing programs let you constrain your mouse movement to the perpendicular axes or 45-degree angles, Canvas's Smart Mouse function will keep track of any combination of 12 different constraint conditions. Canvas rounds out its technical drawing tools with the ability to separate a drawing into discrete layers, redraw complex objects with a macro tool, and read and write .DXF and IGES formats.

Of course, Canvas has standard drawing tools including ovals, rectangles, lines, arcs, and Bezier curves. Whenever possible, the program tries to make drawing and editing objects as easy as possible. Object-level tools like cubes, concentric circles, parallel lines, and starbursts make creating complex elements as easy as dragging the mouse.

SPECIAL EFFECTS

Canvas is no slouch when it comes to special effects, either. One- and two-point perspective, extrusion, enveloping, and

blending let you quickly add three-dimensional, warping, and tweening effects to your drawings. For example, the word *Frog*, shown in the accompanying screen shot, was manipulated into its free-form shape by using the Bezier envelope.

Unlike CorelDRAW and

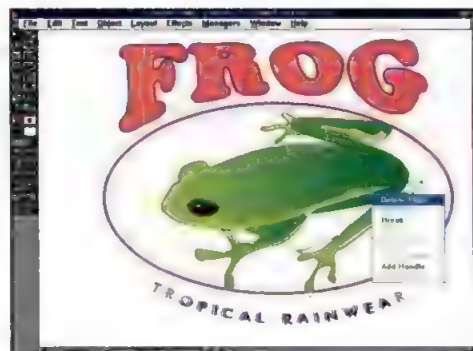
In addition to the special text effects, you can format any of the 25 TrueType fonts that ship with the program as paragraph text (Type 1 fonts are also supported, but not bundled). The program's text linking, alignment, leading, kerning, and tab capabilities are

sufficient for most text layouts, but Canvas doesn't support paragraph level formatting, such as indents, bullets, or margins.

With 120 bitmapped patterns, 18 predefined hatch patterns, and over 300 clip-art images, you can easily dress up your designs. The program also supports five different color models, including Pantone. Applying colors or gradient colors to an object is as simple as clicking a choice in a palette. You can mix custom colors on the fly, but ultimately it's more efficient to create custom colors and gradients and save them to reusable palettes that are quickly accessed as toolbox fly-outs. A Canvas document is limited to a single page, but with a maximum page size of over 9 feet and the ability to print large documents as a series of tiles, you can still produce a wide variety of documents.

IMAGES IN AND OUT

You can incorporate images from other sources into your Canvas creations in one of two ways: Either create OLE objects or open other file formats (such as .BMP, .DXF, EPSF/AI, IGES, .PCX, TIFF, and .WMF) directly. Canvas also lets you save your drawings in the same wide range of file formats—plus one. When you save a file, you have the option of generating separations—creating either individual



DRAWING: This logo was created with Canvas's standard drawing tools.

FACT FILE

Canvas for Windows, Version 3.5
Deneba Software, 7400 SW 87th Ave., Miami, FL 33173;
305-596-5644;
fax, 305-273-9069

List price: \$399.95; competitive upgrade, \$99.95.
Requires: 4MB RAM; 9MB hard disk space; Microsoft Windows, Version 3.x.
In short: A wonderfully versatile drawing program with the unique ability to edit bitmapped pictures from within a vector drawing. Canvas is strong on technical drawing functions such as dimensioning lines, drawing constraints, and macro objects.

ON READER SERVICE CARD

Gold Disk's Professional Draw, however, Canvas does not maintain special effects or the envelope for subsequent manipulation, so after you've created an effect you'll find that the only way to fine-tune the result is to remove the special effect and start over again.

The same annoying situation is true of text effects and simple text wraps. If you apply two effects to a text object, the word is automatically converted to curves and can no longer be edited as text. You

can align text to a path, but to adjust the path you'll have to undo the effect. You can easily flow text around—or even into—an object, but when you modify the layout you'll have to explicitly remove the text wrap and reapply it.



TWO FORMATS: You can edit bitmapped pictures from within a Canvas drawing.

PostScript files for each color or a single QuarkXPress .DCS file.

During our testing, we experienced one serious bug. Exporting files as Encapsulated PostScript or via the Windows Clipboard often resulted in corrupted images that could not be printed on a PostScript printer. In addition, gradient filled objects exported to the TIFF format were plagued with artifacts, such as white bands that cut across several areas of the image. Deneba should have a solution in place soon.

Advantages to Canvas's open architecture include the ability to

customize many of the tools and the ability to load only those tools you need. Modifying a tool is as simple as opening the associated Manager dialog box. For example, you can customize the size and shape of arrowheads or adjust the sensitivity of the pressure pen. Advanced users will also appreciate the ability to create custom toolsets, which can be chosen at startup. So if you don't

need the Concentric Circle tool, you never have to load it.

On the Mac, Canvas has traditionally won converts from other drawing programs by stressing ease of use. Canvas for Windows has the same appeal. Once Deneba has fixed the problematic import/export tools, it should find an enthusiastic audience. □



From October 25 through October 29, you can go online to join in a discussion about Canvas and its features. Type GO ZNT:EXEC from any CompuServe prompt.

■ Programming Languages

32-Bit Visual C++ Makes NT Coding Easier

BY RICHARD HALE SHAW

With integrated code-generation, C++ class management, editing, debugging, and object browsing, Microsoft's Visual C++ for Windows was one of the most important new software development tools to appear in 1993 (First Looks, May 11, 1993). Based on a robust application framework, the Microsoft Foundation Class Library (MFC), Visual C++ easily turned Windows programming drudgery into artistry full of snap, crackle, and pop. The competition is scurrying to imitate it.

Unfortunately, Visual C++ for Windows can't run on or generate 32-bit code for Windows NT, but now Microsoft has taken care of that problem by introducing a \$599 Visual C++ 32-bit Edition for Windows NT and Win32s development.

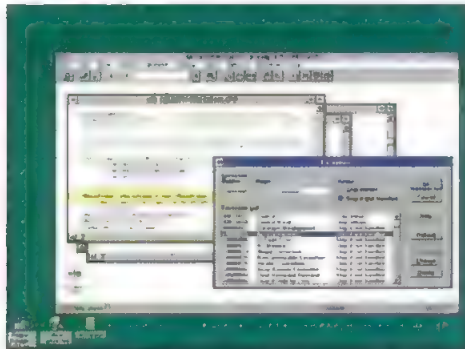
While not as comprehensive as the Win32 Software Development Kit (SDK)—there's no replacement for the SDK's Setup Toolkit, RPC toolkit, or OLE 2.0 Beta toolkit—Visual C++ 32-bit Edition has the essential tools for developing 32-bit applications for Windows NT or Win32s (which is included in the package).

VISUAL WORKBENCH

The 32-bit Edition's Visual WorkBench (VWB) is essentially the same as the one in Visual C++ for Windows. But because it takes advantage of NT's multithreading, it's a crisp, robust environment. It's even easier to switch windows and develop-

ment modes, make changes to options, or edit code—all while compiling or debugging in yet another window. With new additions (such as the integrated profiler), the 32-bit VWB also features a Find in Files dialog for performing Grep-like searches of multiple files, a Break command for debugging, a Stop command for external tools, and a highly requested Memory dump window.

Unlike the character-mode editor in the SDK, the Visual WorkBench editor is fully graphical. The integrated debugger can debug multithreaded applications and specify exceptions to trap and how to handle them. The integrated Source Code profiler replaces the



UP FRONT: You can access advanced facilities such as Win32 exceptions.

SDK's API profiler, and Visual C++'s AppStudio easily supplants the comparatively primitive resource editors in the SDK.

There's also SPY++: an inspection tool that divulges the most intimate details of NT processes, threads, windows, window classes, and messages. SPY++ alone is worth a good quarter of the price of the 32-bit Edition.

All the command-line tools in the 32-bit Edition of Visual C++ are DOS-extended using Phar Lap's TNT technology. You can run all of them from Windows 3.1 or the MS-DOS command line, and there's no need to modify them or to use a DOS extender.

The 32-bit version of MFC remains largely compatible with the 16-bit version. MFC programs that don't use 16-bit-specific features of Windows can be recompiled with the 32-bit version with almost no modifications. The only stumbling blocks involve changes to a couple of MFC member functions and differences between the Win16 and Win32 APIs. If you have avoided using the APIs directly, the latter won't be a problem. The package also includes CVTMAKE, which can convert most of your 16-bit Visual C++ makefiles for use with the 32-bit Edition.

OPTIMIZED COMPILER

The 32-bit Edition's C++ compiler includes features to optimize code for 386, 486, and Pentium machines. Optimizations for 486s include scheduling, code alignment, and frame pointer omission; Pentium optimizations include instruction reordering and the use of simpler code sequences. But the 32-bit VC++ generates 32-bit code for Intel PCs only: You cannot use it on the MIPS or DEC Alpha hardware, or generate code for those platforms or for 16-bit Windows. You'll need the Win32 SDK for those platforms to port any programs you create. And while you can easily recompile MFC and MFC applications on the MIPS, there's currently no support for MFC on the Alpha.

Like most new NT development tools, the 32-bit Edition is available on a single CD-ROM that includes documentation, tools, and four installation options. While print versions are available separately, the 10,000

FACT FILE

Microsoft Visual C++ 32-Bit Edition for Windows and Windows NT, Version 1.0

Microsoft Corp. One Microsoft Way, Redmond, WA 98052; 800-227-4679 ext. 11700/206-882-8080

List price: \$599

Requires: 16MB RAM, 16MB hard disk space (completely installed), Windows NT, Version 3.1

In short: The best C/C++ development environment for Windows NT and Win32s. While some developers may be disappointed with the lack of support for 16-bit VBXs, Win32 and NT developers will find it an excellent addition—if not a replacement—for the essential tools in the Win32 SDK.

ON-READER SERVICE CARD

pages of documentation are provided in "Books On-Line," an invaluable, cross-referenced reference tool that includes the full documentation for the Win32 SDK and Win32s; C/C++ language references, overviews, and API documentation.

If you've developed with 16-bit Visual C++ for Windows, you may be a bit disappointed. For example, Visual Basic controls (VBXs) aren't supported in Windows NT; you can't use VBXs in your 32-bit VC++ applications.

MFC has its limits, too. There's no 32-bit MFC DLL, and you'll have to link your applications to the static MFC libraries. Plus, MFC does little to encapsulate features of the Win32 API: multithreading, console I/O, memory-mapped files, or the 32-bit GDI. While you can use these in your applications, there's no built-in support.

If you're a 16-bit developer moving to 32 bits, you may miss VBX support. But there's no better tool for NT development. If you're already programming in 32 bits, you're going to love the breadth, scope, and integration of this package. □



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■ Sound

Cardinal and Diamond Join the 16-bit Sound Card Battle

BY JOHN R. QUAIN

Choosing the right sound card for your PC just got tougher. Two more 16-bit sound cards from Cardinal Technologies and Diamond Computer Systems have entered the crowded PC audio category. Both 16-bit boards are Roland MPU-401, Sound Blaster, and Ad Lib compatible. Both perform quality 16-bit 44.1-kHz stereo recording and playback and set a new price/performance standard with list prices below \$300.

DIGITAL SOUND PRO 16

Cardinal Technologies' Digital Sound Pro 16 comes in three configurations: a basic model with a proprietary Sony CD-ROM controller built in for \$159, a model with a standard SCSI controller for \$229, and a full MIDI configuration including the SCSI controller for \$299. We saw the \$159 version.

Designed around a 16-bit Analog Devices DSP and digital-to-analog/analog-to-digital converter, the Digital Sound Pro 16 is programmable, so that upgrades, such as adding audio compression, can be loaded from a floppy disk. On the back of the card is a joystick/MIDI connector, as well as mini-jacks for a monaural microphone, stereo input, stereo output, and speakers. An internal audio connection is also provided for an internal CD-ROM drive.

Recordings can be made at the standard sampling rates, depending on the sound quality you desire and storage capacity available. You can choose between stereo or mono 8-bit or 16-bit recording at 11.025 kHz, 22.05 kHz, or CD-quality 44.1-kHz sample rates in .WAV or .VOC file formats.

On the hardware side, Cardinal makes the board easy to install. No jumpers need to be set. All the interrupt and DMA assignments can be made through the software. Unfortunately, the DOS-based software installation routine is a little bumpy.

In testing, we found recording samples using the supplied Voyetra Windows software to be awkward and peppered with minor but frustrating problems. Initial recordings made with the WinDAT recording applet produced an annoying irregular popping noise. After some experimentation, we determined that the card's 4-watt amplifier was clipping the output (cutting off the extreme highs).

The other principal Windows software bundled with the Digital Sound Pro 16 is AudioStation, an attractive, stereo system-like graphic interface that includes a CD audio player, mixer, digital audio file player, and MIDI Diamond Computer Systems player. A suite of complimentary DOS utilities is also included for non-Windows users.

• List price: *Digital Sound Pro 16*, \$159; with SCSI controller, \$229; with wavetable and SCSI, \$299. Requires: *One 16-bit ISA slot, 3MB RAM, 2MB hard disk space, DOS 3.3 or later. Cardinal Technologies Inc., 1827 Freedom Rd., Lancaster, PA 17601; 717-293-3049; fax, 800-775-0899.*

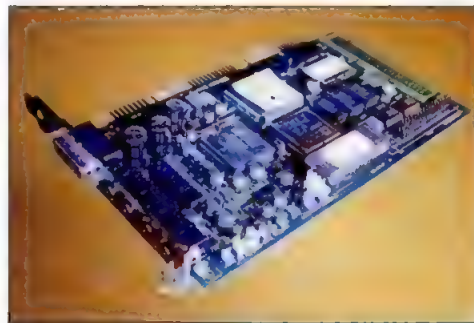
Circle 432 on reader service card

DIAMOND SONIC SOUND

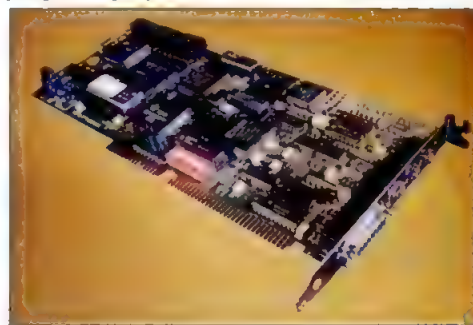
Diamond Computer Systems' \$299 SonicSound is more expen-

sive than the basic Cardinal offering, but it comes standard with a 512K wavetable for MIDI synthesis and a SCSI controller. A comparably configured version of Cardinal's card is also priced at \$299.

The SonicSound is based on the Sierra Aria chipset, which is the basis for several other sound boards including those from AVM, Computer Peripherals,



DIGITAL SOUND PRO 16: Nearly plug-and-play.



SONICSOUND: Good sound, tough setup.

and Genoa. What distinguishes Diamond's entry from the other Sierra-based boards is its lower price tag and superior sound quality.

To keep the price low, Diamond chose to forego the Sierra-supported voice recognition feature that the other vendors offer standard on their versions. Most users won't mind the omission, but if you want voice recogni-

tion, Diamond offers a Listener upgrade package for approximately \$90.

To improve the audio quality, Diamond added its own logic to the Aria chip set in order to raise the board's frequency response ceiling and sampling size. Like the Cardinal board, the SonicSound can reproduce and record sounds covering the audible hearing range, including full 16-bit stereo recording. Distortion and noise is also lower than many other sound boards in this price range.

The Diamond SonicSound comes equipped with one stereo output for external speakers, a joystick/MIDI connector, and two stereo input mini-jacks. One of the audio inputs can be set as a mono or stereo microphone input or switched to line-level input through software. The SonicSound also includes an internal audio input and SCSI-2 controller as standard features.

Diamond's board is potentially more difficult to install than Cardinal's Digital Sound Pro 16. Unlike Cardinal's, Diamond's board is littered with jumpers used to set interrupt, DMA, and

Sound Blaster compatibility. Luckily, our installation worked with the board's defaults.

In order to support its audio features, Diamond bundles a strong group of Windows soft-

ware applications, including Macromedia's Action! MIDIsoft's Recording Session, MCS Music-Rack for playing back audio CDs, and a set of DOS utilities.

• List price: *Diamond SonicSound*, \$299. Requires: *One free 16-bit ISA slot, 640K RAM, 4MB hard disk space, DOS 3.1 or later (Microsoft Windows 3.1). Diamond Computer Systems Inc., 1130 East Arques Ave., Sunnyvale, CA 94086; 408-736-2000; fax: 408-730-5750.*

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Beauty And dBASE.

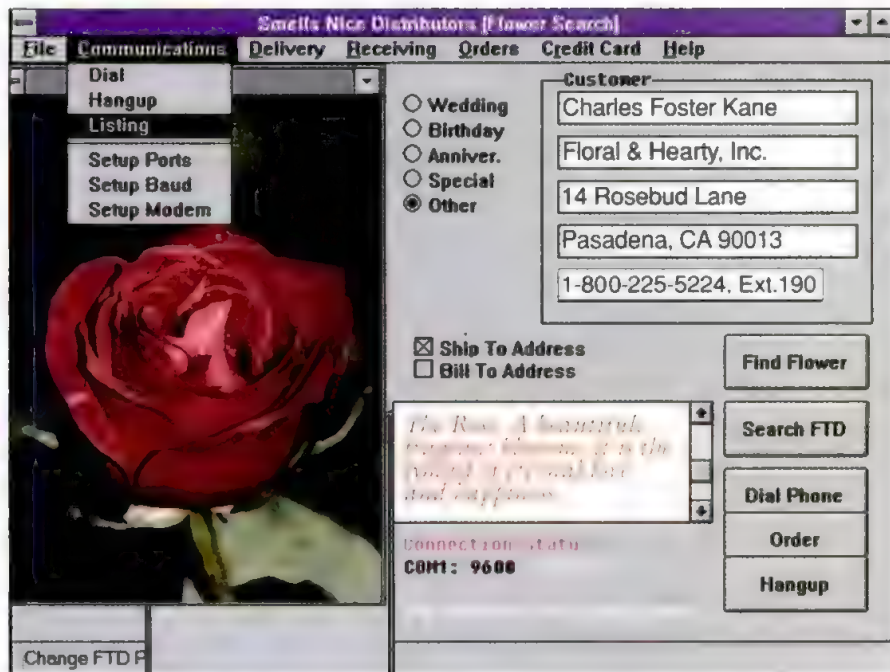


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debugger that's so advanced it lets you watch your source code execute at run time - even Single Step through execution.



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The Visual Application Designer (VAD) makes creating pull-down menus, push buttons, radio buttons, check boxes, scrolling list boxes and other Windows objects as easy as "point and click" or "drag and drop."

The VAD generates the required source code, saving you hours of complex programming. You also get a

CA-dBFast 2.0 also includes CA-RET - an outstanding Windows-based report writer that lets you mix text, graphics and data on the same report in a full WYSIWYG environment.

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CIRCLE 400 ON READER SERVICE CARD

Technical Presentation

See Clear, Practical Science with SigmaPlot

BY BARRY SIMON

Jandel Scientific's \$495 SigmaPlot for Windows shares many of the same characteristics that made the DOS version the standard for scientific graphing software: solid workmanship that provides the basic, yet essential, graph types, a powerful curve-fitting language, and considerable ease of use.

SigmaPlot includes the most important technical plot types: line/scatter, bar, pie, box, 3-D scatter, and 3-D mesh. What it lacks are contour and polar plots. It is also missing more esoteric types, such as Smith, and shadowed contour surfaces.

PLOTTING YOUR OWN

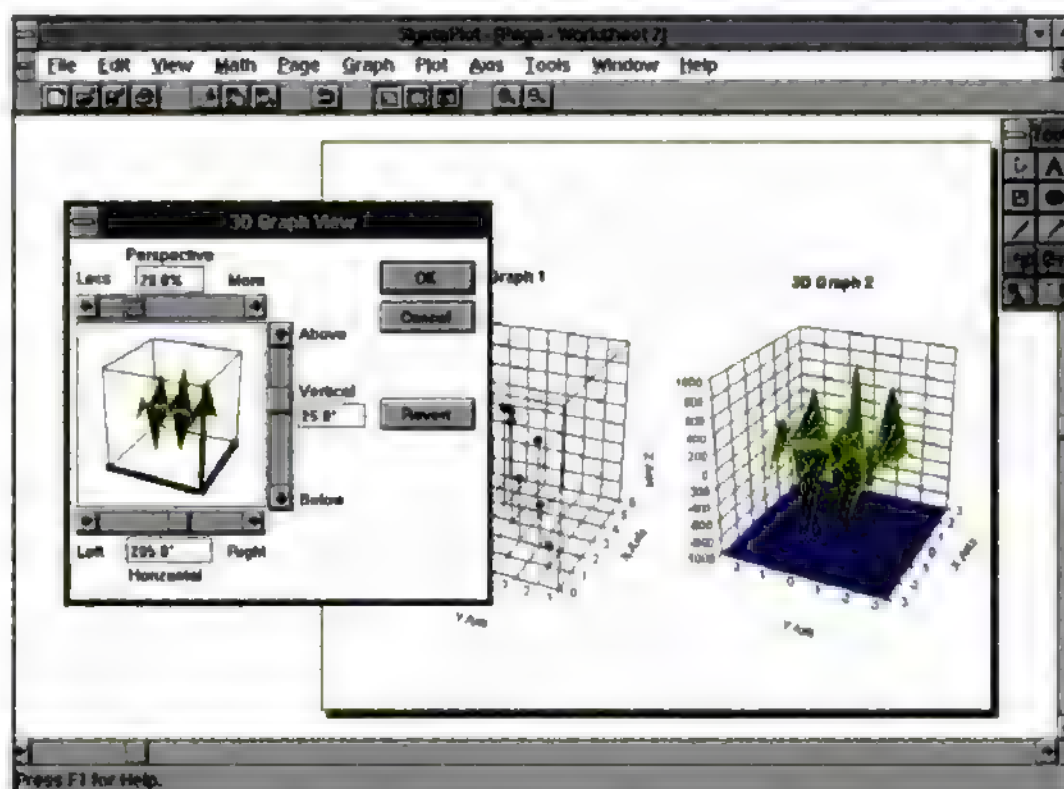
Supported plots are customized simply and easily. You can control text, symbols used, line type, axis scale and ticks, multiple axes, and colors. These options are accessed by double-clicking on the object. It's easy to add multiple graphs to a page or multiple plots, even different plot types to a single graph. How-

ever, changing individual bar colors is more awkward and must be done through a worksheet command.

SigmaPlot supports any TrueType or Adobe font but does not work with Adobe's

acters by switching to the symbol font. But SigmaPlot provides no simple way to figure out what math symbols are associated with what keys.

One nice touch is that you can save libraries of graph attrib-



3D: SigmaPlot's 3D graphs come with a dialog box to set the viewpoint.

ATM. Since Windows ships with a symbol font that includes Greek letters and mathematical signs, you can enter these char-

acters in a style galley for later use.

SigmaPlot's strength lies in the analytic tools it can apply to a problem. Doing a regression fit

(by polynomials up to degree 10) is a simple menu command. Statistics on data in a worksheet are accessed with one click on the button bar. By using SigmaPlot's specialized batch language, users can create more sophisticated analysis routines, including multiple parameter fits and histogram binning.

While SigmaPlot was extremely stable, there were a few glitches. It got confused by a font I have called "Symbol B" and refused to find Windows' standard Symbol font until my third-party font was removed. Also, Undo worked improperly a few times, either undoing several steps or just ignoring the command.

If your graphing needs are simple, but your analysis needs substantial, SigmaPlot for Windows is a well-built, friendly application that you will treasure.

• List price: *SigmaPlot for Windows, Version 1.0*, \$495; upgrade from DOS version, \$149. Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 3.1; math coprocessor recommended. Jandel Scientific, P.O. Box 7005, San Rafael, CA 94912; 800-874-1888, 415-453-6700; 415-453-7769.

Circle 435 on reader service card

Video Capture

\$349 Captivator Grabs Full-Motion Video

BY ALFRED POOR

Now that we expect our computers to be able to sing and dance, how do we get moving images of our own onto our systems' hard disks? VideoLogic has addressed this problem with a new video capture card called the Captivator.

The \$349 card is a half-length, 16-bit ISA board whose custom chips make it possible to process incoming video images faster and with more sophistication than many competing designs, so you get full-motion video that runs smoother with better image quality.

The product was designed

from the ground up to work with Microsoft Video for Windows, which includes a capture utility, a copy of Media Player for viewing AVI format movies, utilities to edit palettes and bitmapped images, and a CD-ROM filled with video clips. VideoLogic adds its own drivers for Video for Windows, plus a Windows utility for capturing still images from a video signal.

The Captivator has two different inputs: an RCA jack for NTSC-composite video and a DIN socket for S-Video. One of the advantages here is that you can have separate signals hooked up to each connector and switch between the sources

using the software.

A key strength of the card is the way it scales images to different sizes. VideoLogic's ASICs go to work on the image as it comes in and average the values from adjacent pixels when scaling down the image size. The net effect is a better-quality image.

Viewing and capturing motion video from a VCR or video camera or laser disk is simple and effective. The only problem we encountered during testing was that the VideoLogic still-capture utility had trouble synchronizing on the composite video from a home VCR; VideoLogic says that this is not uncommon

with inexpensive equipment and that the problem would probably not appear with a production-quality unit.

In any case, the Video for Windows capture utility worked fine with the VCR, and we were able to capture 15 fps at 272 by 204 pixels without losing a single frame (using a 66-MHz DX2-based system). The board is capable of 320 by 240 pixels at 30 fps.

When it comes to capturing video images, the Captivator will bring them back alive.

• List price: *Captivator*, \$349. Requires: 4MB RAM; 100MB hard disk space (recommended); Microsoft Windows, Version 3.1. VideoLogic Inc., 245 First St., Cambridge, MA 02142; 800-578-5644, 617-494-0530; fax, 617-494-0534.

Circle 422 on reader service card

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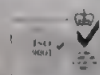
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■ Spreadsheet Utilities

CompressMate Makes Spreadsheet Files up to 70 Percent Smaller

BY CRAIG STINSON

CompressMate is a \$99 on-the-fly utility for compressing your spreadsheet files. The current version supports DOS spreadsheets only—Lotus 1-2-3, Release 2.x and Release 3.x; Symphony; and Quattro Pro 4.0. A subsequent release will support the major Windows spreadsheets.

Like Symantec's SQZ, to which it stands in direct competition, CompressMate operates transparently. To save a file in compressed form, you simply change the filename extension—from .WK1 to .WK@, from .WK3 to .WK#, from .WQ1 to .WQ@. To retrieve a compressed file, you just use the normal /FR command sequence. File load times are increased slightly, but not painfully, in the process.

Like SQZ, CompressMate offers the option of removing formula values and blank cells from your saved files. If you remove formula values (the program's default mode), you need to recalculate your worksheet on retrieval to get those values back, but the logic of your worksheet is not affected, and file compression is significantly increased. The only serious drawback to this option is that file viewers such as Magellan see N/As instead of calculated values. If you choose the remove-blank option, the program eliminates formatting information from empty cells, saving a few additional bytes of disk space in the process. Password-protected files cannot be compressed.

CompressMate's compression ratios are impressive. We tested the program with 35 .WK1 files and achieved an average saving in file size of 71 per-

cent. Savings on individual files ranged from 97 percent for a file consisting mostly of formulas to 36 percent for one consisting exclusively of text. With a similar number of Quattro Pro files, CompressMate turned in an average compression of 64 per-

cent. On the same files, SQZ, which is included in Quattro Pro, was able to achieve only 16 percent average compression.

For convenience, CompressMate also has batch-mode operation, letting you type a single DOS command to compress all of your existing worksheet files at once. The program also offers a standalone decompression utility that you are free to distribute. That way, you can pack a bushel of .WK1 files onto a floppy disk, add the 52K DECOMP.COM file, and send the package off to another user

who doesn't have CompressMate.

For any Quattro Pro or 1-2-3 for DOS user who could use a few extra bytes on-disk, CompressMate is well worth its modest purchase price.

• List price: *CompressMate, Version 1.0*, \$99 (\$79 through December 31, 1993). Requires: 20K RAM; Lotus 1-2-3, Release 2.x or 3.x; Symphony; or Quattro Pro 4.0 for DOS. Intex Solutions Inc., 35 Highland Circle, Needham, MA 02194; 617-449-6222; fax, 617-444-2318.

Circle 423 on reader service card

■ MassStorage

Pinnacle Micro's Tahoe: Portable MO Storage

BY GREG PASTRICK

With its success at making fast, high-capacity 650MB 5.25-inch external magneto-optical (MO) drives and 128MB 3.5-inch MO drives already established, Pinnacle Micro now heads for the portable market with the \$1,199 Tahoe-130.

Rewritable magneto-optical drives make a lot of sense as secondary storage or tape-backup replacement devices. And the downsizing of MO devices to 128MB, 3.5-inch media has brought better technology and faster rotation speeds to the drives. With more portables serving double-duty as desktop system substitutes and road machines, the need for added and secure storage media is obvious.

QUICK AND CARRY

The Tahoe-130 has a rated seek time of 28 milliseconds and a rotation speed of 3,600 rpm. Though it isn't as fast as conventional hard disks of equal capacity, the device itself beats just about any desktop 3.5-inch MO device out there, and the media is highly secure and easily transportable.

Average throughput for the Tahoe is 780 kilobits per second. Most 3.5-inch MO drives on the

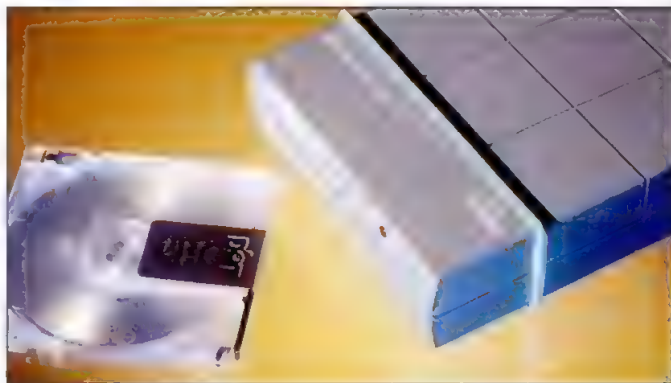
market from manufacturers like Image Network Technology, Panasonic, Peripheral Land Infinity, Ricoh, and Sony manage 640 Kbps, with seek times ranging from 33 to 40 ms.

The drive unit weighs under 2 pounds, and its optional rechargeable battery pack is rated for 3.5 hours of usage. Disk-intensive tasks will easily cut that time in half; even so, the Tahoe-130's battery life beats that of

package includes Macintosh and PC software, manuals, cables, and an AC power adapter.

Installation of the Pinnacle Micro/Trantor SCSI and ASPI drivers is automatic from the MiniSCSI setup disk. The provided utilities also quickly format and mount the MO disks.

The Tahoe-130's high-speed 128MB MO disks list for \$69, but street prices range from \$40 to \$50 for the same 3.5-inch media. What's more, you can always double the capacity using disk-doubling software. Pinnacle Micro will be releasing a PCMCIA Type II SCSI adapter for the Tahoe-130 soon.



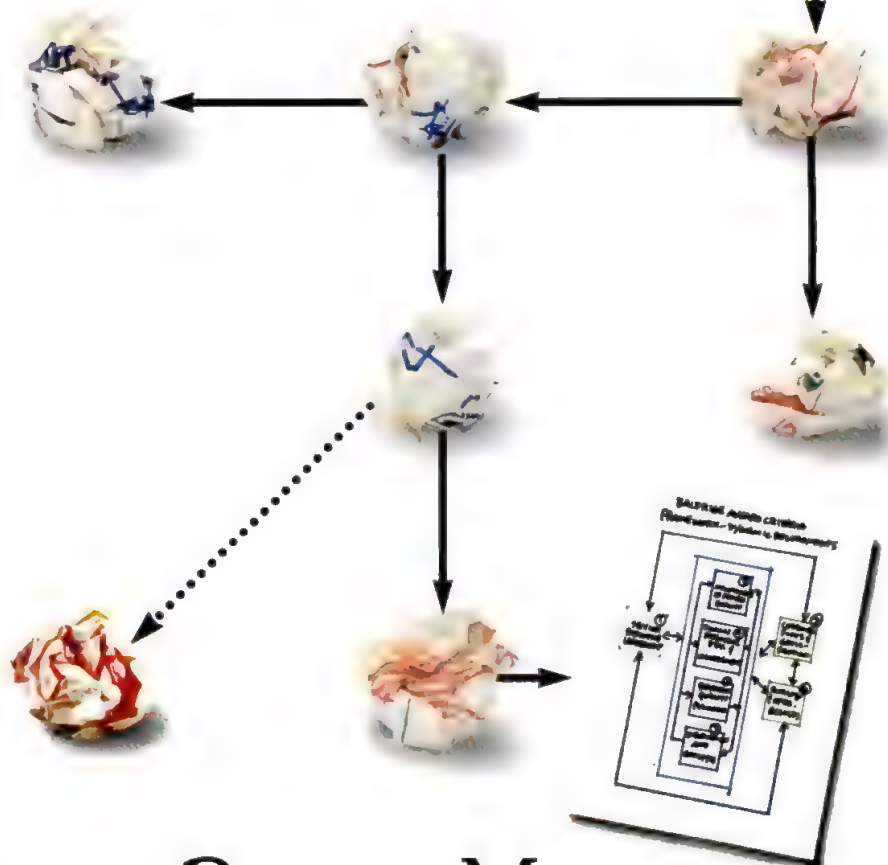
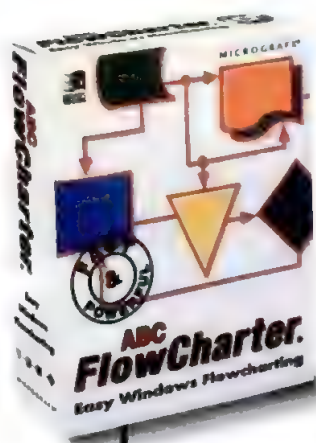
CARRYING POWER: The portable Tahoe-130 is ready to run and ride.

most notebook batteries.

Measuring 1.4 by 4.5 by 8 inches (HWD), the Tahoe-130 comes standard with a Trantor MiniSCSI Plus SCSI II adapter. The adapter features a printer-priority pass-through connector and plugs directly into the notebook's parallel port. The Tahoe

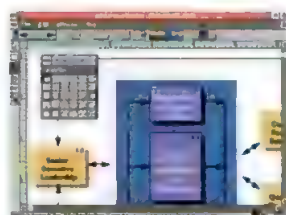
• List price: *Tahoe-130 with Trantor MiniSCSI*, \$1,199; with *Adaptec AHA-1542C*, \$1,299; *battery pack*, \$99; *disks*, \$69; *travel pack*, \$199. Pinnacle Micro Inc., 19 Technology, Irvine, CA 92718; 800-553-7070, 714-727-3300; fax, 714-727-1913.

Circle 436 on reader service card



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■ Printer Enhancement

PrintCache 3.1: High-Speed Printing That Gives Voice to Your Printer

BY EDWARD MENDELSON

PrintCache has always sent your data to your printer faster than any other utility, but with Version 3.1 of LaserTools' \$99.95 package, now your printer can talk back. PrintCache is still the fastest and best designed print spooler on the market, which means that after giving the print command, you regain control of the keyboard sooner than with any other print utility. But the program now displays the same message displayed on the LaserJet 4 control panel, and when you use it under Windows with any printer, it can use your sound card to alert you when your printer is out of paper.

When you install PrintCache, you set aside some expanded or extended memory or some disk space as a buffer in which to

store print jobs until the printer is ready for them. Because RAM or a disk file can accept data faster than the printer, you get



REAL-TIME: PrintCache 3.1's displays look like LaserJet displays.

back control of the keyboard faster than you would without a spooler. Uniquely among spoolers, PrintCache uses a hardware interrupt to determine instantly

when the printer can accept data, so you also get data into the printer at top speed. An optional DOS pop-up (using 16K of RAM) and a Windows dialog box both tell you the printer status and let you suspend printing, clear the buffer, or eject the page.

PrintCache works well with all printers, but with the LaserJet 4 and 4M it gives on-screen status reports with the same detail that users of other LaserJets can get from Microsoft's cartridge-based Windows Printing System. Both the DOS and Windows status displays give detailed real-

time reports from the printer on the job number, current page number, and the text visible on the printer's control panel.

With PrintCache operating, a typically complex QuarkXPress page took 50 seconds to print to a LaserJet 4. With the Windows Print Manager, the same page took 6 minutes. With PrintCache loaded, WordPerfect 6.0 returns control of the keyboard about twice as fast as it does normally.

Unlike PrintQ or the Windows Control Panel, PrintCache doesn't let you reorder or cancel individual print jobs, but standalone users generally don't need that feature, and network users already have it. What PrintCache does give you is the greatest increase in printing speed that you can get without buying a new printer.

● **List price:** *PrintCache, Version 3.1*, \$99.95. Requires: 7K RAM, DOS 2.1 or later. *LaserTools Corp.*, 1250 45th St., #100, Emeryville, CA 94608; 800-767-8004, 510-420-8777; fax, 510-420-1150.

Circle 420 on reader service card

■ Remote Control

Close-Up 5.0 Speeds Up Windows Computing From a Distance

BY CAROL ELLISON

Version 5.0 of Norton-Lambert's \$199 Close-Up remote computing program is smarter and faster than ever, and it's finally able to run Windows from afar about as handily as if there were no telephone line between the host computer you're controlling and the remote computer you're using to dial in.

The new Close-Up uses 4-to-1 compression to boost the effective speed on-line to 38,400 bits per second (bps). By using a technique Norton-Lambert calls "photographic memory" to buffer screen images in the remote computer's memory,

screen redraws occur as quickly on the remote PC as they do in the host once the screen data is buffered. It's the kind of technology that Windows users with heavy remote computing needs have been waiting for.

Another dramatic improvement is Close-Up's new automatic installation. It runs diagnostics on your system and automatically configures itself to your setup. About all you have to do is select your modem type from the generous list the program supports. Close-Up remains a DOS product, but it comes with a .PIF file and automatically installs itself for Windows. Best of all, however, is that Close-Up doesn't tamper with your Windows .INI

files, as its competitors do.

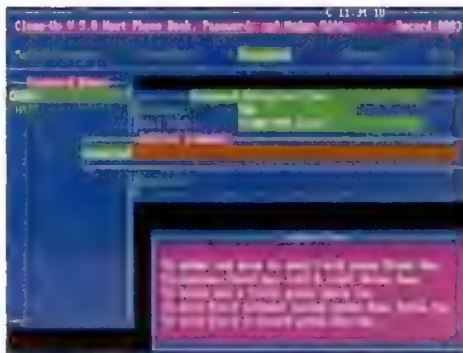
This version of Close-Up preserves the well-implemented multilevel security features, logs, phonebooks, interactive chat windows, and scripting tools that helped it earn our Editors' Choice in 1992. Its file transfer

and we transferred a text file of more than 150K in 18 seconds.

While most of its competitors have moved to a split-screen transfer method in which you simultaneously view files on both the host and remote and tag those you want to transfer, Close-Up's

transfer method is a bit old-fashioned. It still forces you to enter the path and filenames of the files you want to send.

● **List price:** *Close-Up, Version 5.0*, \$199 (host and remote). Requires: 275K RAM (remote), DOS 3.3 or later, 1.5MB hard disk space, Microsoft Windows 3.1



CONTROL: System managers set up user passwords in the Close-Up phonebook.

speed, impressive then, is more impressive now. A batch transfer of four .PCX files, each larger than 120K, took less than a minute and a half on noisy lines,

or later (optional). *Norton-Lambert Corp.*, P.O. Box 4085, Santa Barbara, CA 93140; 805-964-6767; fax, 805-683-5679.

Circle 419 on reader service card

PC Magazine Reveals:



The Computer That
Gives You The Most
Bang For The Buck.

Others pale in comparison. There's no way to dispute it! The results are in, and the ZEOS Upgradable 486DX2-66 is "the overall performance winner."

PC buyers expect low prices, top-quality, impeccable performance and prompt support. Basically, they want the most bang for their buck. *PC Magazine* recognized this and compared value-line PCs with more traditional systems to see if they were "truly good values or stripped-down machines trying to pass for good buys." The results are overwhelmingly in ZEOS' favor.

In fact, *PC Magazine* said: "ZEOS doesn't sell a separate value line, but the flexibility of its main system may be the least confusing solution of all."

Stacked against Gateway, Dell, Compaq, IBM and others, ZEOS stood alone. Using the Benchmark Tests as a guide, *PC Magazine* made these conclusions:

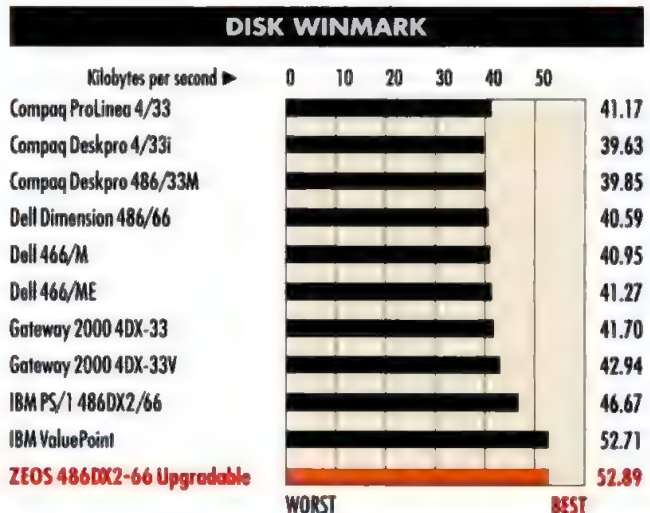
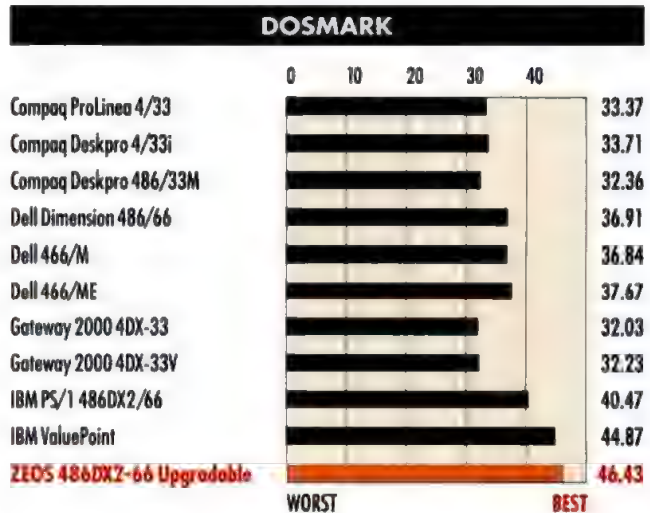
"The clear winner is ZEOS' Diamond Viper VLB card in the ZEOS Upgradable, which turned in an incredible score of 55.01 megapixels per second."

"The real highlight among tested hard disks

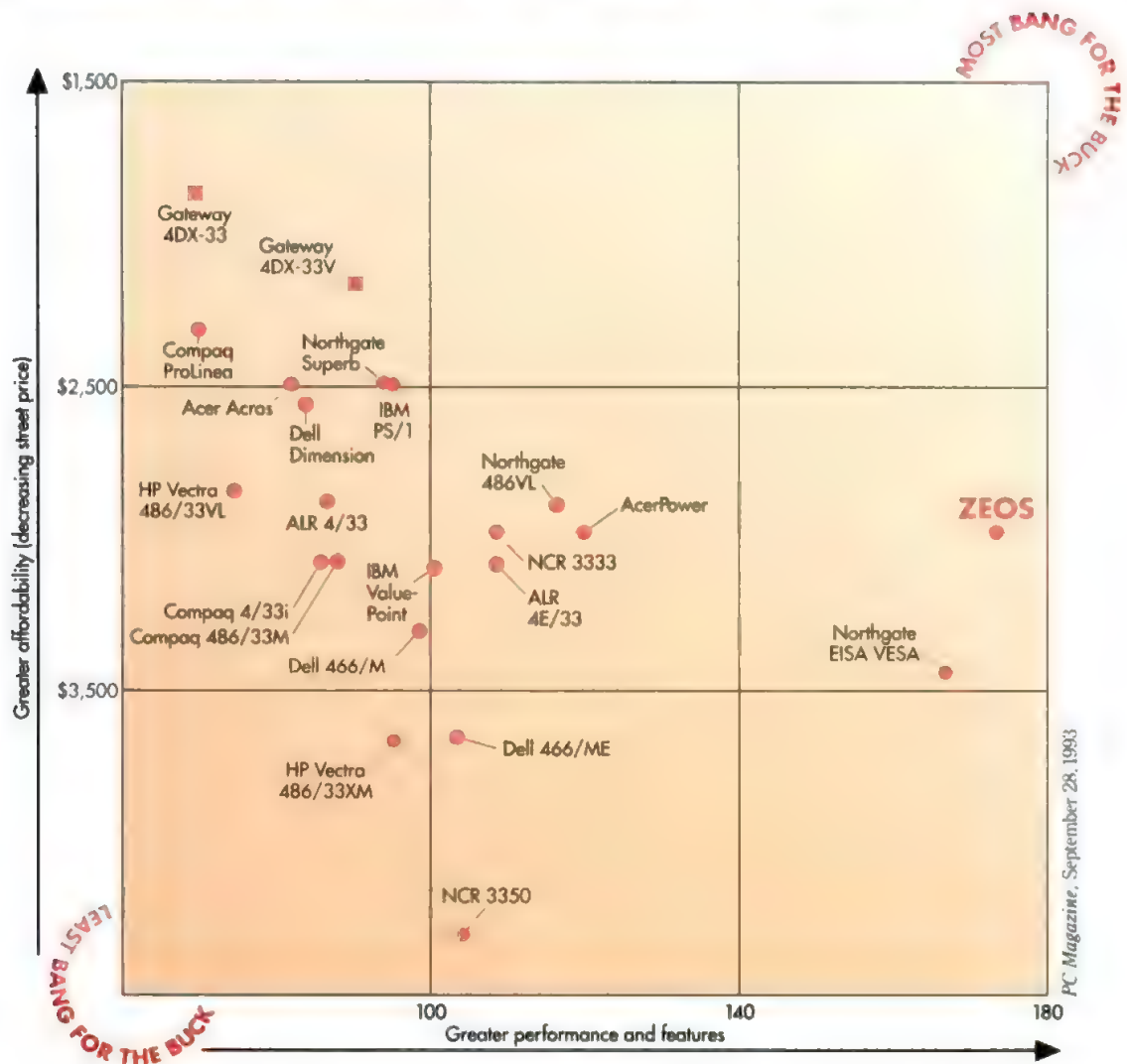
The Numbers Don't Lie.



The winning ZEOS system can easily be upgraded to a 10-bay vertical case for only \$95.



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- Genuine Intel 486DX2-66 Micro-processor, upgradable to Pentium™ OverDrive™
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- 528MB local bus IDE hard drive with 256K cache
- Diamond Viper/VLB local bus video card with 1MB VRAM
- 1.2MB and 1.44MB floppy drives
- 15" ZEOS color SVGA non-interlaced monitor, .28mm dot pitch
- 14,400 bps V.32 bis send/receive fax modem
- MS-DOS 6 with Enhanced Tools, Windows, and new Microsoft Mouse, plus choice of Lotus Windows applications
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This is just one ZEOS local bus upgradable configuration. Look on next page for additional money-saving packages or custom configurations.

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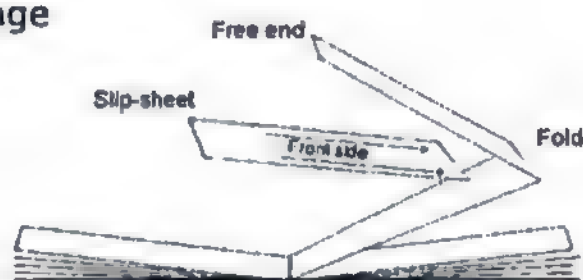
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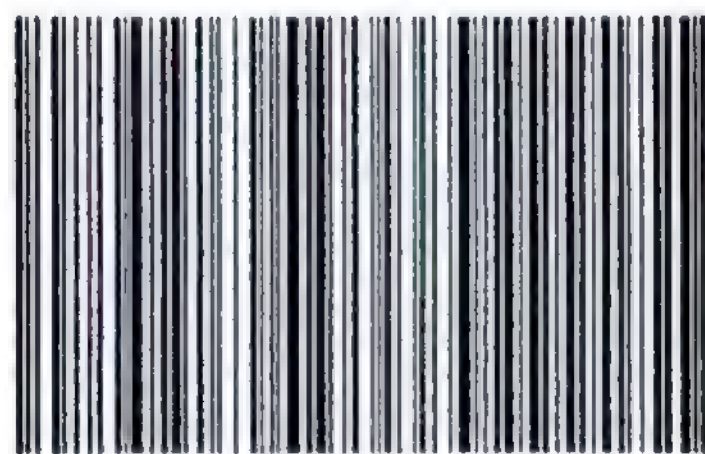


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3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



GbsSlipSheet-001

Inverted Foldout slip-sheet

Folded edge of the page

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2. Arrow pointing to the fold

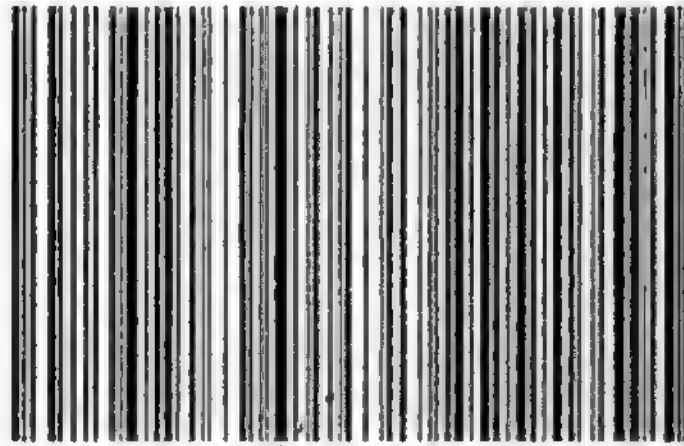
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlpBack-001B

Back

1. Follow instructions on the other side

was the Seagate ST3600A, which has 12-ms access time and 256K of built-in cache. The ZEOS 486DX2-66 Upgradable's hard disk performance was almost 31 percent above the average in this roundup."

"As DOSmark scores are heavily weighted for processor and hard disk performance, the ZEOS garnered the first-place position in that category as well."

"...It was the top performer in Windows graphics and on DOSmark and DOS disk tests."

Of the "systems that demonstrated the best agility under strenuous exercise of all their components...ZEOS (scored) 26 percent above average."

The ZEOS local bus upgradable systems are the perfect solution—the brand-new motherboard is faster, more integrated, versatile and

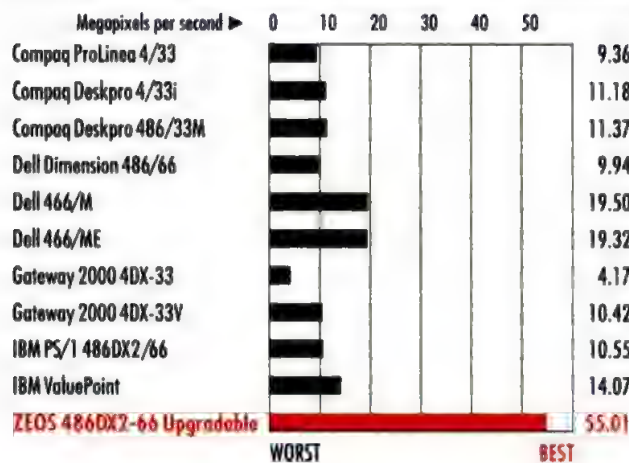


reliable than ever. Plus, ZEOS is always thinking ahead to your future needs and technological advances; therefore, we include such features as CPU upgradability to Intel's Pentium OverDrive;

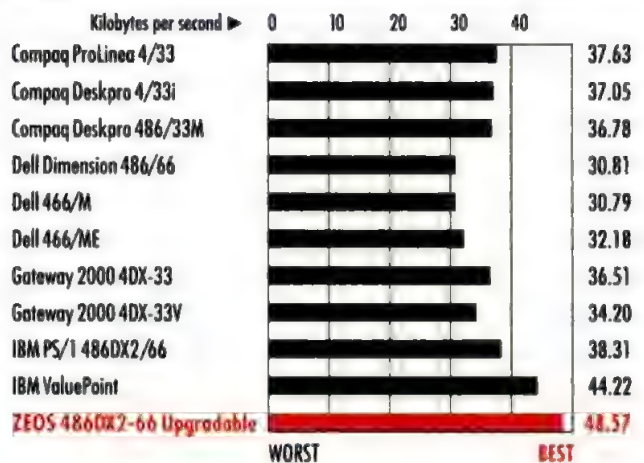
a Zero Insertion Force (ZIF) CPU socket, Flash BIOS for easy upgradability, and a SCSI upgrade socket for adding SCSI without having to use a slot. We've even given you room to grow with eight expansion slots and more drive bays than the competition.

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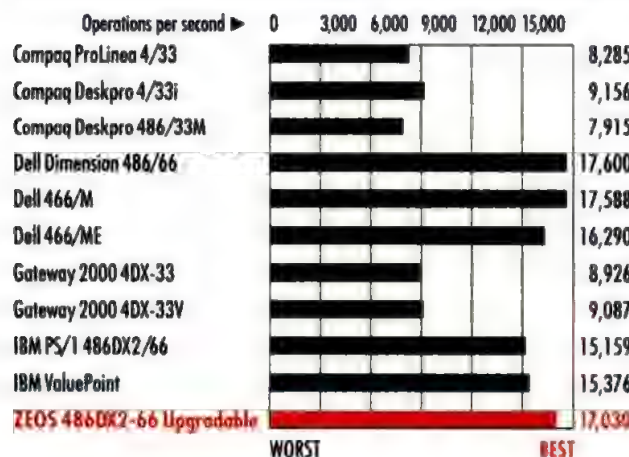
GRAPHICS WINMARK



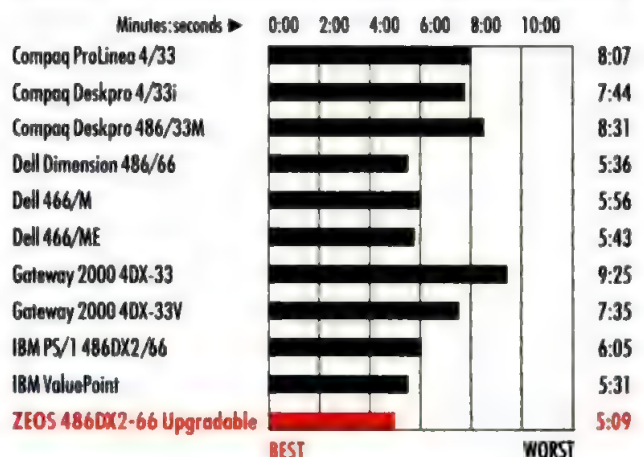
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- Choice of Windows application

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486
DX2-66



486
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- Windows-accelerated local bus video
- SVGA color monitor
- Both floppies
- DOS, Windows, Mouse
- Choice of Windows application

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486
DX2-66

PACKAGE #4 PLUS:

- 16MB RAM
- 528MB local bus hard drive with built-in 256K cache
- Windows-accelerated local bus video
- Diamond Viper video card
- Vertical case
- 15" SVGA color monitor
- Both floppies
- DOS, Windows, Mouse
- Choice of Windows application

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486SX-25

PACKAGE #1:

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Circle 155 on reader service card.

CAD

Vellum's Drafting Assistant Reads Minds, Draws Lines

BY WILL SCHLETER

If you've tried using traditional CAD software but get bogged down in the intricacies of commands, coordinates, and construction methods, you'll find Ashlar Vellum 3D for Windows, \$2,995 from Ashlar Inc., a fascinating breath of fresh air.

Vellum simplifies the task of using a CAD system. There's no command line; mouse and menu picks are streamlined significantly; and an impressive Drafting Assistant feature watches every mouse move to create construction lines for tangents, alignments, intersections, and snap points dynamically. Ashlar has succeeded in creating one of the easiest to use CAD systems available for Windows.

New to Version 2.12 is an on-screen 3D trackball for easy dynamic rotation of any view, a triad display to help you visualize how

a view is oriented, extrude and revolve functions for quickly creating 3D wireframe geometry from a 2D cross-section, and many options for managing views and work planes. Vellum looks and works the same as the Macintosh version and is 100 percent file compatible with it.

A standard Windows installation procedure installs Vellum 3D quickly and painlessly, and context-sensitive on-line help is available for every operation.

A WATCHFUL EYE

One of the keys to Vellum's ease of use is its patented Drafting Assistant. Sitting behind the scenes monitoring every mouse movement, the Drafting Assistant's presence is immediately evident when small cues such as "endpoint," "midpoint," "on," or "align" appear on the screen as you move the pointer across existing geometry. The cursor snaps to the closest object and displays temporary construction lines as appropriate for tangencies, perpendicularities, intersections, and alignments, as the Drafting Assistant makes assumptions about what you are trying to do.

An internal Geometric Inference Engine driven by just six basic rules is the brains behind the Drafting Assistant. Though it deals mainly with planar geometry, The Drafting Assistance does extend into the third dimension by identifying alignments in the Z direction. Since Vellum treats the working plane and the viewing plane separately, you can use all of the power of the Drafting Assistant while working in an isometric view. On the downside, the Drafting Assistant often gets confused when the display is cluttered with too many lines, but shrewd

layer management and on-the-fly zooming make its life (and yours) easier.

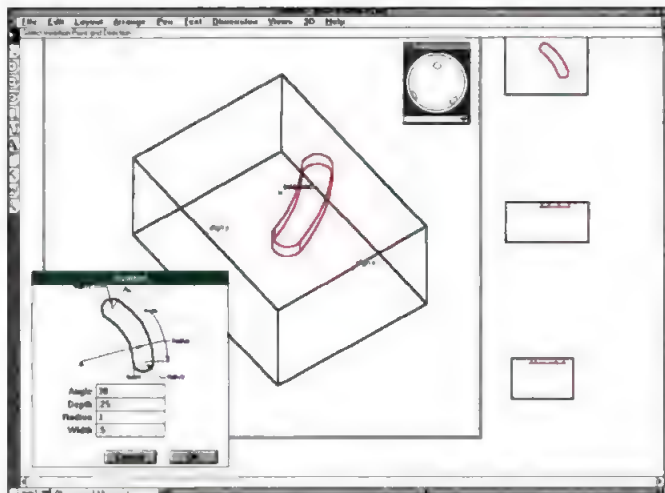
STRETCHING OUT

Once a 3D wireframe model is created in Vellum 3D, a single command lays out orthographic views ready for dimensioning. A change in any view is reflected in all of the views until you have to

functions are available, and Vellum uses "Smart pointers" to help guide you along your intended path.

Vellum also includes parametric capabilities that let you define relationships among geometric objects. Used with the included symbol libraries, the parametric features help you generate variations of an object from a single symbol file. This is more than just simple scaling, because you control the dimensions used to define the symbol.

While Vellum feels right at home in the Windows environment, it doesn't support OLE (Object Linking and Embed-



ONE STEP AHEAD: The Drafting Assistant guesses your next move.

"flatten" and disassociate a view in order to remove hidden lines. As you might expect in such a wireframe system, there's no provision for automatic hidden line removal.

Another key to Vellum's ease of use is that many functions are extensions of basic functions and are accessed with a combination of the Control and/or Shift keys and a mouse click. For example, to move an object, you just select it and drag it to its new location. The Drafting Assistant makes locating it a snap. To copy it, you use the same procedure while depressing the Control key.

Vellum makes extensive use of visual feedback. A prompt line always reminds you what

ding) or DDE (Dynamic Data Exchange). However, data can be exchanged via the Windows Clipboard, and the CAD standards of .DXF (2D and 3D) and IGES are supported for both import and export. Several different drawing files can be worked on simultaneously thanks to Vellum's support of Window's Multiple Document Interface (MDI).

Vellum 3D hasn't yet spawned a large number of third-party applications the way industry leader AutoCAD has, but its intuitive user interface is unparalleled by any other CAD system. Vellum fits the bill as a conceptual design tool that doesn't get in the way of the creative process. □

FACT FILE

Ashlar Vellum 3D for Windows, Version 2.12

Ashlar Inc., 1290 Oakmead Pkwy., #218 Sunnyvale, CA 94086; 800-877-2745, 408-746-1800; fax: 408-746-0749

List price: \$2,995 (Ashlar Vellum 2D: \$2,495)

Requires: 5MB RAM (8MB recommended), 8MB hard disk space, Microsoft Windows 3.1 running in 386-Enhanced mode

In short: Ashlar Vellum 3D is unparalleled in the CAD world with its easy-to-learn and easy-to-use approach to design and drafting. At \$2,995, it's targeted at professional designers who feel handcuffed by the details of operating traditional CAD systems

ON READER SERVICE CARD

■ Communications

Cyberdesk Gathers Your E-Mail from Every Source

BY NEIL J. RUBENKING

Chances are you have electronic mail accounts on several systems and correspondents on still other systems. You need one product that will organize access to all of them. Cyberdesk, \$395 from CyberCorp Inc., manages MCI Mail, CompuServe Mail, The WELL, and cc:Mail on a LAN. It distinguishes itself by also handling CompuServe and ZiffNet forums.

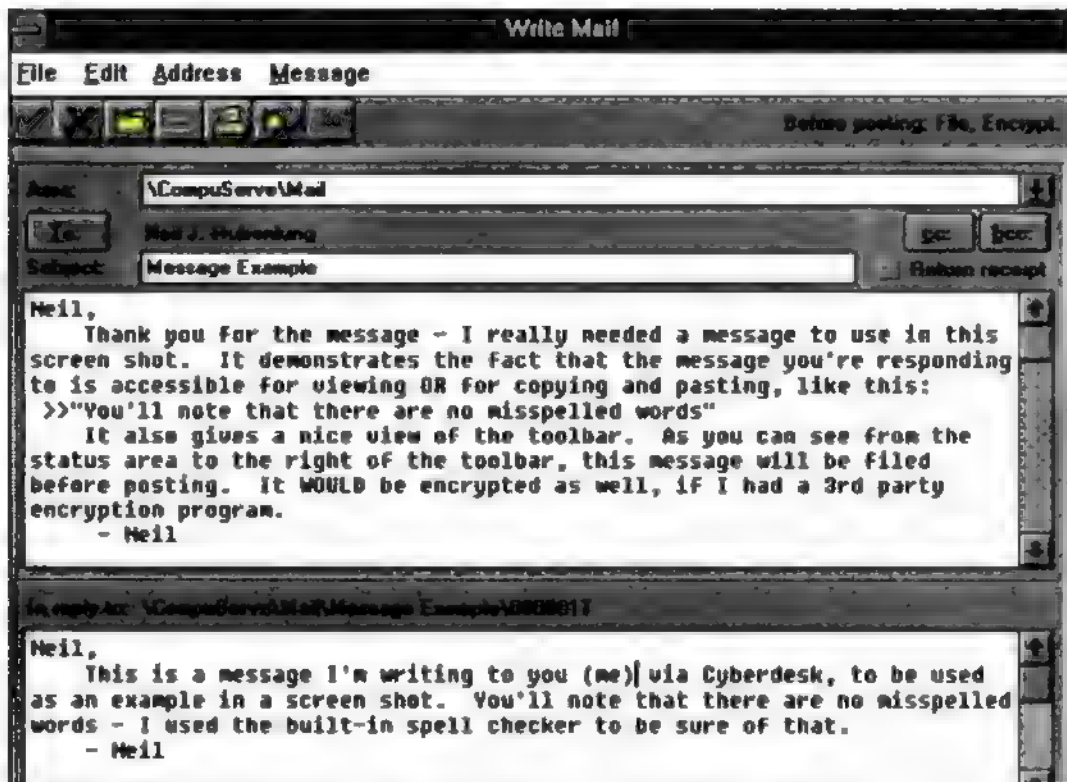
Each service is supported by external subprograms called *agents*, so CyberCorp can add support for another service simply by releasing new agents. The top level of Cyberdesk's graphical interface is a customizable map of your personal "cyberspace" (your collection of electronic information services).

You configure Cyberdesk with access information for each of your mail accounts and optionally select forums and forum sections for CompuServe and ZiffNet. After that, sending and receiving mail is as simple as selecting Full Flight from the Autopilot menu. Cyberdesk accesses each system, sending and receiving mail at top speed. You read and respond to your mail off-line to minimize

access charges and use the same interface for all mail systems. Cyberdesk stores addresses for all supported systems in a single list and automatically routes mail to other e-mail systems.

Cyberdesk associates related messages into "conversations" even when the underlying message system doesn't support this feature. You file conversations or messages in user-defined folders, or let Cyberdesk file them automatically based on subject, sender, or other criteria. You can call its 90,000-word spell-checker to catch typos, and invoke a third-party encryption program for message security. Cyberdesk will gather file abstracts and download files you select using Zmodem, CompuServe B+, or several other protocols. It also automates the process of uploading files and attaching files to messages.

This first version of Cyberdesk is impressively useful, but it does have some minor rough edges, notably its non-context-sensitive help system. Editing a message you haven't yet sent requires copying it to the Clipboard, deleting it, and creating a new message. Don't hesitate to try Cyberdesk, though. In the un-



MAILBOX: Cyberdesk's off-line mail response screen.

likely event that you decide to take advantage of its money-back guarantee, you'll cheer its automatic deinstallation.

• List price: *Cyberdesk, Version 1.0*, \$395; introductory price, \$179, available through Decem-

ber 31, 1993. Requires: 800K RAM, 2.5MB hard disk space, Windows 3.1. CyberCorp Inc., P.O. Drawer 1988, Kennesaw, GA 30144; 404-424-6240; fax, 404-424-8995.

Circle 425 on reader service card

■ Windows Utilities

Fantastic Recall Starts Up Windows Where You Left Off

BY DAVID HASKIN

Binar Graphics' Fantastic Recall, Version 1.0, is a time-saving utility that lets you resume a Windows session precisely where you left off. But while this \$79.95 product is handy, beware: It doesn't work in all environments.

When you exit Windows, Fantastic Recall writes an image of all aspects of your session to disk. When you restart Windows, the program loads the image into memory, letting you resume your session precisely where you stopped. Besides saving an auto-resume image, Fantastic Recall also

lets you use Windows' normal exit method, or exit and then load a previously saved image.

While auto-resume is common for laptops and notebooks, the most similar utility for desktop PCs is PC Tools for Windows, which works differently, simply noting which applications are open when you exit and then reloading them when you restart Windows.

In our tests, Fantastic Recall was great at reinstating multiple open applications and open files. In addition, it accurately reinstated applications and open files to virtual desktops. Virtual desktop utilities, such as the one included with PC Tools for Windows, provide discrete screen space for multiple applications.

Besides being accurate, Fantastic Recall worked significant-

ly faster than PC Tools for Windows. With two open applications and several open files, Fantastic Recall took longer to exit Windows—about 20 seconds compared with 8 seconds for PC Tools. But Fantastic Recall fully resumed the Windows session in 18 seconds, while PC Tools took 50 seconds to restart Windows and reload all of the previously open applications.



Multiple Exits: Choose your departure.

Fantastic Recall has its limitations. It doesn't work with two memory managers—NetRoom 3.0 from Helix Software and QEMM 7.0 from Quarterdeck Systems—that use tricky memory-mapping schemes to free upper memory. Also, if you use Stacker, you must load Fantastic Recall on an uncompressed drive.

If you stop and start your computer a lot, Fantastic Recall will save you time. Whether it will work for you, however, depends on the other programs you use for managing your computing environment.

• List price: *Fantastic Recall, Version 1.0*, \$79.95. Requires: 1MB RAM, Windows 3.1. Binar Graphics, 30 Mitchell Blvd., San Rafael, CA 94903; 800-228-0666, 415-491-4182; fax, 415-491-1164.

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■ Disk Utilities

Ontrack's Drive Rocket: Taking IDE to Its Limit

BY BEN MYERS

The people at Ontrack Computer Systems say their DOS device driver, the \$39.95 Drive Rocket, will push the performance envelope of your IDE hard disk. Does it live up to its billing? Well, yes and no.

Ontrack claims an improvement of up to 80 percent in the overall data transfer rate. Initial tests with a Western Digital Caviar 2250 hard disk attached to the IDE connector on board a 66-MHz 486DX/2 Micronics EISA/VL system were consistent with Ontrack's data. But because our initial test results showed a six-fold improvement for single-sector accesses, we knew that there was more to Drive Rocket than first met the eye.

GETTING THERE FIRST

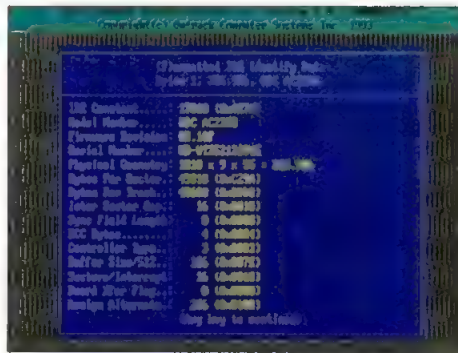
Additional tests revealed that Drive Rocket's boost comes from two sources. The greatest gain in disk throughput is a result of Drive Rocket's running in fast system random access memory (RAM), where it intercepts all disk accesses before they get to the ROM BIOS. We verified this by testing with system ROM BIOS shadowed in RAM, a feature available in most PC BIOS setups and in memory managers such as Quarterdeck's QEMM and Qualitas' 386MAX. Drive Rocket milks the last bit of performance improvement through its treatment of multisector reads and writes.

When a program reads or writes more than one disk sector (512 bytes) at a time, the typical PC BIOS generates hardware interrupts after each sector is processed. Drive Rocket takes advantage of the multisector read/write capability built into most IDE drives and speeds up

hard disk accesses by eliminating all but one interrupt per program request.

The action of a software disk cache gives Drive Rocket a greater percentage of multisector reads and writes. Expect the greatest improvement when you run an application such as FoxPro, which already takes ad-

vantage of very large multisector disk accesses to gain its speed. Quite useful, but curiously



EASY INSTALL: Drive Rocket identifies disk types before it speeds them up.

omitted from the documentation, is a tiny TSR utility called DH that tells you the percentages of disk reads and writes by number of sectors, classified according to sequential or random access patterns.

• List price: *Drive Rocket, Version 1.01*, \$39.95. Requires: 3K RAM, DOS 3.0 or later. Ontrack Computer Systems, 6321 Bury Dr., Eden Prairie, MN 55346; 800-752-1333, 612-937-1107; fax, 612-937-5815.

Circle 434 on reader service card

■ Screen Utilities

What Comes After Dark? Microsoft Scenes

BY DON TRIVETTE

Microsoft proves beauty is more than skin deep with its new \$29.95 screen saver, Microsoft Scenes. This feature-laden utility is attractive, easy to use, and even useful.

Certainly, the Sierra Club Collection of rugged mountains, lush forests, and stunning sunsets will satisfy the environmentally deprived. But tastes vary, so Microsoft also offers an Outer Space collection: Saturn's rings, the lunar surface, and an astronaut's stroll in space. An Impressionists Collection includes paintings from the works of Cezanne, Renoir, Degas, and Monet. Each collection has more than 40 scenes you can add to and delete from using the Scenes Wizard utility.

If none of the collections strike your fancy, you send your own favorite 3-by-4- and 4-by-6-inch photos to Genigraphics, along with the enclosed coupon, and you'll get three free scans.

You can also add any bit-mapped graphics file with a .BMP or .DIB extension to the program to complete your own collection. An After Dark option lets you attach scenes from Microsoft Scenes to After Dark and run them as part of that pop-

ular screen saver.

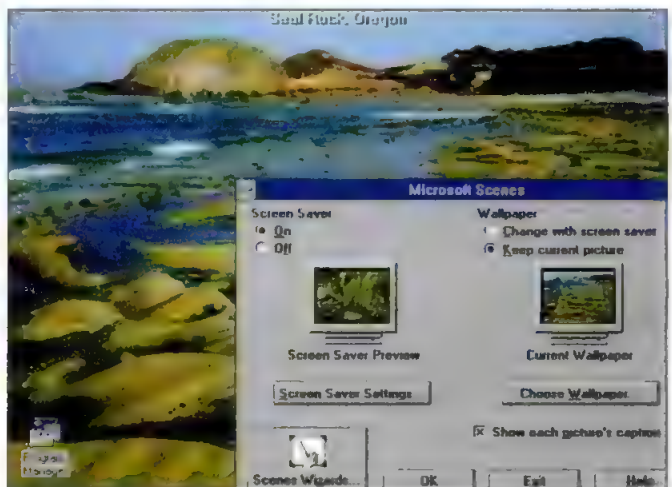
These scenes can also replace Windows 3.1 wallpaper or run as a sort of screen-saving slide show. You select the inactivity period that initiates the screen saver, as well as the time interval between scene changes. Microsoft Scenes' dozen transition effects include cut, dissolve, wipe, and random. A security feature prevents anyone who doesn't know your password from viewing the underlying screen.

To save disk space, all photographic images are compressed via JPEG to about one fourth their original size. The entire Sierra Club collection uses

1.7MB on the hard disk. Since they are compressed, each image must expand and convert itself to a .BMP file when you first open it, and that takes several seconds to happen. If you don't mind the wait, Scenes is a fine screen saver, especially if you want to get your kids or your dog up on screen.

• List price: *Microsoft Scenes, Version 1.0*, \$29.95. Requires: 2MB RAM, 3MB hard disk space. Microsoft Windows 3.1. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-880-8080; fax, 206-936-7329.

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NATURALLY: Sierra Club images are one of three collections.

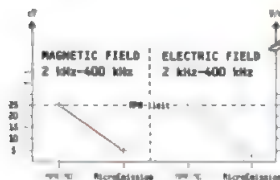
OUR MONITORS LAST SO LONG, WE'VE HAD TO EXTEND THE LIVES OF OUR CUSTOMERS.

True, nobody's drawn a direct connection between video display emissions and longevity. But people are worried enough to have government-set limits on them. The strictest limits come from Scandinavia. So do the monitors that cut these emissions so low they can't even be measured: Nokia.

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 far surpass even TCO*—the toughest emissions standards in the world—with bonded display panels and full metal encasement.

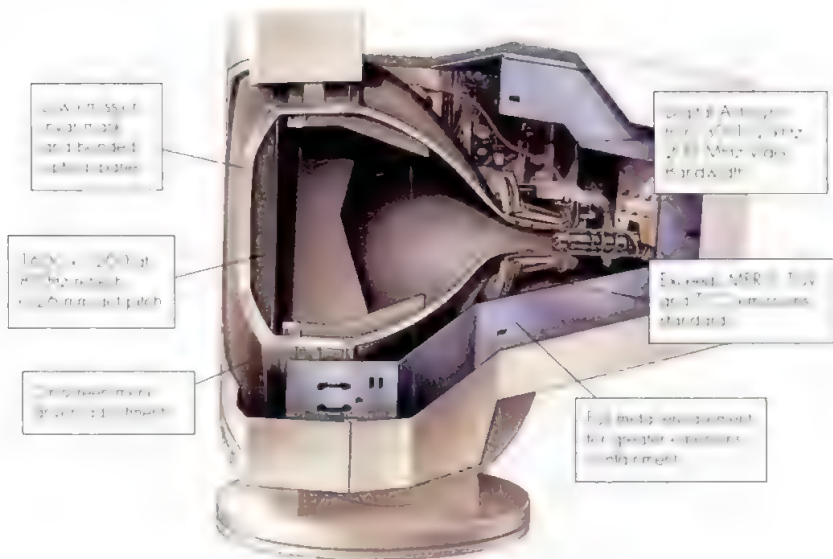
Fine. But what does that leave you to look at?

Well, Nokia MultiGraph® series monitors are arguably the most vivid in the world. In fact, the vast 21" unit achieves a



Nokia MicroEmission greatly reduces magnetic and electrical fields exposure below the current Swedish MPR-90 standards

1600 x 1200 display at a remarkable 80 Hz refresh rate with 0.26 mm dot pitch. In other words: Huge, clear and absolutely flicker-free.



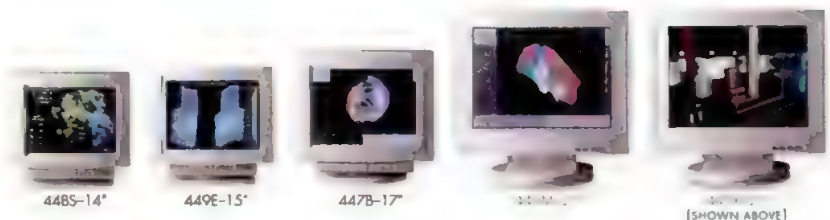
The unique FullScreen® feature eliminates the dead border without edge distortion. The picture can be adjusted not just horizontally and vertically, but also trapezoidally and orthogonally. More impressively, the DigiControl™ on-screen menu-driven display adjustment can memorize your workstyle preferences (which is faster, easier, and far more precise than reaching for knobs hidden in the back

somewhere.) And Nokia monitors offer user-defined PowerSaver™ which further reduces those wicked emissions. It also saves the tube and helps the whole unit last longer.

Before you buy your next monitor, look into a Nokia. It could be the decision of a lifetime. Call 1.800.BY NOKIA, Dept. E5 for the dealer nearest you.

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■ Windows Utilities

Four New Ways to Button Up Windows

BY BARRY SIMON

Windows' flexible interface continues to spawn innovative utilities that can increase your productivity. We've gathered four new products that help you redo your menus.

COMMAND VIEW

Artist Graphics' \$50 Command View pops up an application-dependent icon palette with a right mouse click. The palettes, which you can also set to remain visible at all times, have 20 user icons and four Command View icons by default. One Command View icon invokes a configuration dialog for any icon you choose.

The most powerful of the five actions you can assign to an icon is to invoke a menu choice from the application. Command View reads the application menus, so choosing an assignment is as simple as scrolling through a pull-down list. Other actions include launching a program, sending a text string to the application, and calling up a subsidiary pad.

In programs that already use the right mouse button, you assign the double right click, or, with appropriate mice, the middle button to Command View on a per-application basis. You can have a pad assigned to the desktop and even a pad that works in a windowed DOS session (it reads only the Windows control menu items). The program comes with prebuilt pads for many popular applications. One of its weaknesses, however, is that it doesn't

understand file associations.

• List price: *Command View, Version 2.0*, \$49.95. Artist Graphics, 2675 Patton Rd., St. Paul, MN 55113; 612-631-7800, fax, 612-631-7802.

Circle 428 on reader service card

PROMENU

Cain International's \$70 ProMenu simplifies menu access under Windows. Install it, and when you click the right mouse button, the main menu for whatever Windows-based software you're running pops up. The top-level menu items appear first. As you drag the mouse down, the application's sub-

Windows desktop gives you similar access to your Program Manager items for launch or task switching.

Borland's Quattro Pro took over the right mouse button so forcefully, however, that ProMenu doesn't work there. For other programs that use the right button, like Microsoft Excel, you can configure ProMenu to pass a right double click through as a single click so you don't lose functionality.

• List price: *ProMenu, Version 1.2*, \$70. Cain International Corp., 5001 Orleans Court, Kensington, MD 20895; 800-793-2246, 617-556-9294.

Circle 429 on reader service card

SMART PALETTE

Like Command View, QSoft's \$149 Smart Palette also provides application-dependent icon palettes that float on-screen and can be moved outside the application window if they get in your

mands as Command View does, Smart Palette sends only keystrokes.

What makes Smart Palette so powerful, though, is that commands from Smart Palette's extensive scripting language can be added to icon macros.

Commands include DDE calls, user input via text or file browse dialogs, playing .WAV files, and copying or deletion of disk files. The language can be manipulated (arithmetically, for example) with built-in variables such as the date. You can also place strings in the clipboard and enter them into your app.

On the downside, scripts have to be typed in a single-line, scrolling entry box and are limited to 1,000 characters.

• List price: *Smart Palette, Version 1.1*, \$149 (\$79 through December 31). Q-Soft, 16 Winter St., #33C, Waltham, MA 02154; 617-899-4685.

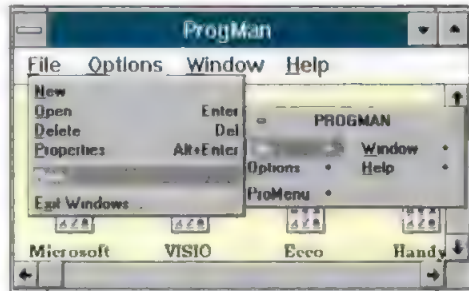
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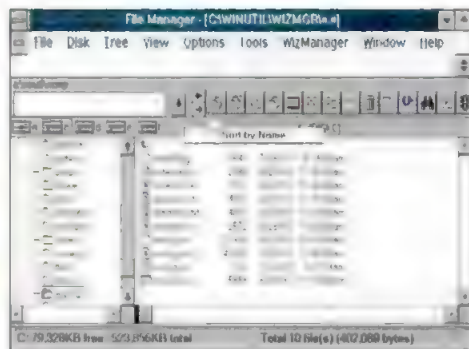
ALWAYS THINKING: Smart Palette's icons are clear.



PROGRAM MANAGER: Command View has built-in icons.



QUICK CONTROL: ProMenu uses the right mouse button.



WHAT'S IN THEREP: WizManager shows the function of each icon.

WIZMANAGER

Mijenix's \$40 shareware WizManager automatically loads with the File Manager, adding a toolbar, a command box, and a WizManager menu to it. The scrolling toolbar gives you access to WizMan's functions and all File Manager menu items.

The box to the left of the toolbar lets you quickly key in commands that might take a bit more pointing and clicking with an unadorned File Manager.

Another welcome addition WizManager brings to File Manager is the ability to print out directory and tree listings. The tree list can include all files and/or total directory sizes.

• List price: *WizManager, Version 1.1*, \$39.95 as shareware. Mijenix, 6666 Odana Rd., #326 Madison, WI 53719; 608-277-1971; fax, 608-277-1971.

Circle 431 on reader service card

menus are also displayed.

You can even cycle through menus of other applications you have running. Using the right mouse button on the

way. Like Command View, the icons are easy to configure, and the program reads the application menu commands. But rather than send the menu com-

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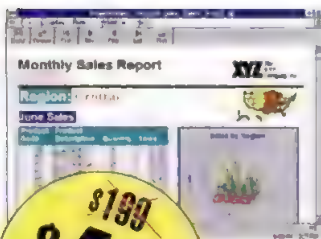
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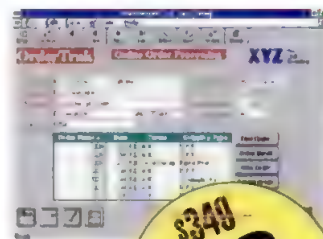
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Utilities

LabelPro for Windows: Helpful, but Sticky in Spots

BY BARRY BRENESAL

Generating labels for a mailing list is a tedious process. It has only one benefit: developing the virtue of patience. Avery's promising yet kludgy new \$129.95 LabelPro for Windows can help. But even here, patience is required.

LabelPro sets about its task like a form designer. You can either open an existing label design or create a new one. In the latter case, you begin by choosing an Avery label type; there are more than 150 stored by number and category (pinned address labels, badges, video cassette spines, and more). Next, you apply the art and text elements to your label. There are icons to click on for lines, circles, round- and square-edged boxes, bar codes, graphics, and text. Finally, you link the results to an address database, then merge the fields. LabelPro supports a wide variety of merge file formats, including ASCII, dBASE, Paradox, WordPerfect, and Microsoft Word for Windows.

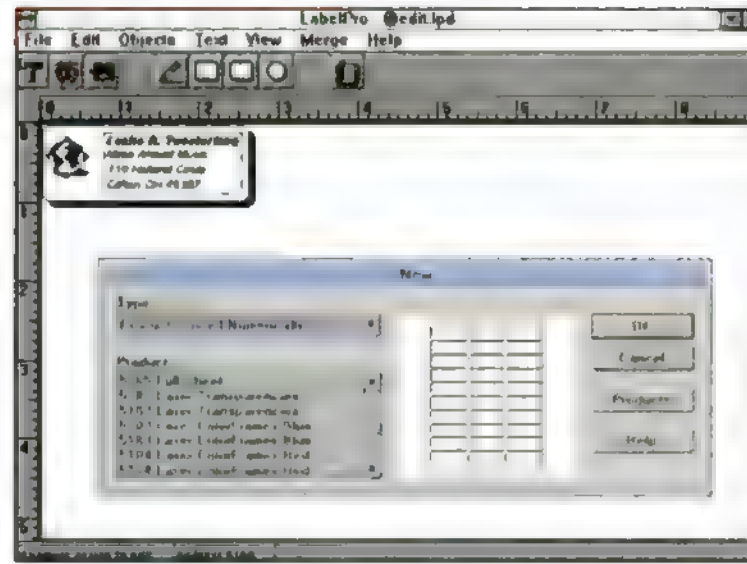
It sounds simple, but unfortunately, it isn't. This is a product that's so streamlined it often fails to provide the necessary tools for all the different ways you might want to work with labels.

Suppose, for instance, you want to type in three labels manually and print them. Your first surprise will come when you try to enter text on a label: nothing happens. You forgot to define a text area with the appropriate tool. Also, don't assume that you can see how a colorful .BMP graphic will look against a magenta label: LabelPro doesn't display colors.

Once you've entered the contents of one label, you realize there isn't a second one on screen. One label at a time is the limit for manual entry. You can still print

it, but you'll end up using a full sheet of Avery labels in the process. That's because you can't define the number of labels to print at a given time—only the number of label pages, which is both wasteful and too complex.

While it's nice to have a miniaturized display of a label or label page as you scroll through Avery's available products, dimensions don't accompany



PREVIEW: LabelPro shows Avery label sheets.

the images.

There are some good ideas in LabelPro—like its strong merge capabilities, extensive library of

label types, and bar code support. But this version runs a bit too much like a test balloon for what's sure to be an improved Version 2.

• **List price:** Avery LabelPro for Windows, \$129.95. Requires: 2MB RAM, 3.5MB hard disk space, Windows 3.x. Avery

Division, 20955 Pathfinder Rd., Diamond Bar, CA 91765; 800-252-8379, 909-869-7711.

Circle 426 on reader service card

Workgroup Computing

With Meeting Maker, PC and Mac Users Can Get Together

BY TONY POMPILI

With ON Technology's new cross-platform Meeting Maker XP scheduling software, Windows and Macintosh users can plan to do lunch together. The program (about \$79 per station), which has been popular on the Mac for years, negotiates and confirms meetings among networked PC and Mac users and adeptly addresses the mechanics of creating group activities.

ON Technology did a great job with the interface. You create and modify meetings and activities either through dialog boxes or, more intuitively, by clicking and dragging meetings on the Daily and Monthly Views. Once meetings are proposed, you can reschedule them by moving them around the Daily view. Meeting Maker automatically senses the change and sends out an update. The program includes a number of views and can also schedule resources,

such as audio/visual equipment and conference rooms.

NETWORK BUILDING BLOCKS

Meeting Maker XP's peer-to-peer architecture works with an ordinary PC or Mac as its server. The server can be either dedicated or shared on a regular Windows user's machine. PCs communicate using NetWare IPX and NetBIOS, and Macs use ON Technology's IPX implementation over EtherTalk. We tested in a PC environment

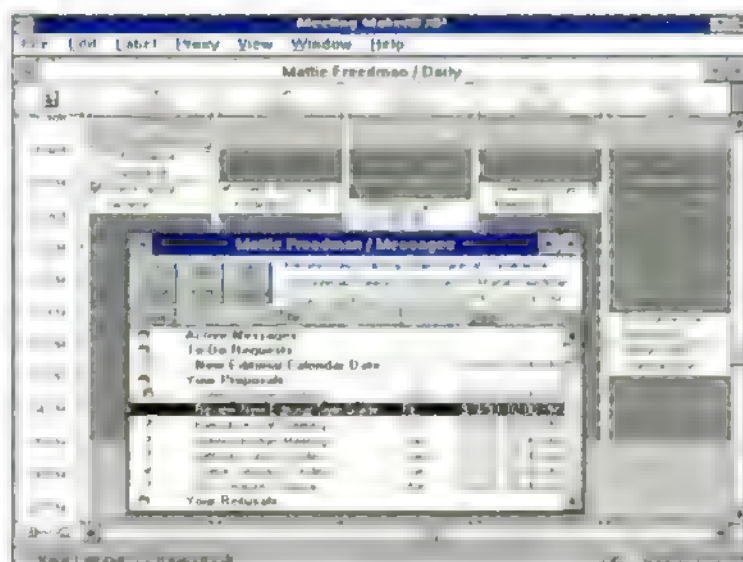
pending on the topology. When you propose a meeting, it queries each criterion dynamically. If you select the list of users and then select a time for the meeting, it checks each user's schedule and then indicates whether the person is available or has a conflict. On a 16-Mbps single-ring LAN, this took less than a second. On a 4-Mbps multi-router LAN, it took between 10 and 15 seconds with the same eight user accounts.

One Meeting Maker feature lets you work off-line, maintaining a copy of your schedule on your own hard disk. Obviously, you can't see up-to-the-minute changes in meetings, but you can respond to meeting requests that are uploaded to the server the next time you log on.

Meeting Maker XP has all you need to bring everyone together, on PCs and Macs.

• **List price:** Meeting Maker XP, Version 1.0: 10 users, \$790; 50 users, \$3,750; 100 users, \$7,000. Requires: 4MB RAM, 6MB hard disk space, Windows 3.1. ON Technology Inc., 1 Cambridge Center, Cambridge, MA 02142; 800-548-8871, 617-876-0900; fax, 617-374-1433.

Circle 427 on reader service card



LET'S MEET: Meeting Maker finds the best time.

using a 486 desktop system with 8MB of RAM as the server. The test network was a 4-Mbps Token-Ring LAN.

Meeting Maker's performance was very different de-

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RADARSAT is a low orbit satellite that will take radar images of the earth. The engineering, design and manufacturing stages for this \$300 million project are being scheduled using Primavera Project Planner® (P3®).

The Autobahn, Germany

P3 will be used to rebuild the Autobahn in what was formerly

East Germany. Both contractors and subcontractors are standardizing on Primavera for this project.

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This \$20 billion airport construction project also includes the construction of highways, an airport rail system, a suspension bridge and a cable stay bridge. Projected completion date is June 1997.

Kuala Lumpur Tower, Malaysia

This \$100 million, 420-meter tower will be the third tallest communication tower in the world. Estimated completion date is 1996.

The Georgia Dome, USA

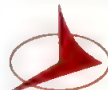
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New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Brad Grimes

IMPROVED

Writing Your Own Windows Help Just Got Easier

Imagine writing a manual using Microsoft Word for Windows, then hitting a button and generating an on-line Windows Help file. That's what you've been able to do with Doc-To-Help, **WexTech Systems'** Word for Windows add-on; now, with Version 1.5, you can do it more easily. Doc-To-Help 1.5 gives you access to all the Windows 3.1 Help Engine features (the Microsoft Help Compiler is actually included in Doc-To-Help). You can also add your WordBasic routines to the Help conversion and almost completely automate and customize the conversion process to fit your needs. Moreover, it now has an interactive macro editor that prompts you through the job of writing the macro, then links and embeds your macros for you. In addition, Doc-To-Help now lets you import RTF (Rich Text Format) files into your current Help file.



An outline view of your Doc-To-Help file makes it easy to add hypertext links.

Version 1.5 also includes interactive windows control, so you can specify the size, placement, and colors of all Help windows. It also supports Microsoft's Segmented Hypergraphics Editor (also included in Doc-To-Help) for creating multiple hot spots on a Help graphic. Doc-To-Help is also available for international versions of Word for Windows at \$375.

• List price: *Doc-To-Help, Version 1.5*, \$295 (upgrade for \$15; if you purchased *Doc-To-Help* after May 1993, the upgrade is free). **WexTech Systems Inc.**, 310 Madison Ave., #905, New York, NY 10017; 212-949-9595; fax, 212-949-4007.

Circle 404 on reader service card

HOT PROSPECT



Nomadic Systems' SmartSync Speeds Up File Synchronization

The goal of **Nomadic Systems'** new SmartSync is to simplify the process of synchronizing files on multiple PCs and to cut down the amount of time it takes to update files. You don't have to remember what files you've added or modified; the software automatically performs a complete synchronization between two PCs. You can also schedule SmartSync to synchronize files or directories without using macros or scripts.

SmartSync uses a proprietary technology called SmartDelta to reduce the time it takes to synchronize files. Rather than transfer and overwrite entire files, SmartDelta compares files on multiple PCs and then transmits just the changes. This cuts data transmission time dramatically and makes remote synchronization more cost-effective.

RemoteCopy lets you browse and copy files from one PC to another. If a transmission is interrupted, SmartSync's auto-recovery utility reestablishes a connection and continues the process from the point where the session was broken. If files are synchronized by mistake, there is an Undo Sync command; and if files are modified on two PCs without an being synchronized, the Conflict Manager saves both versions rather than overwriting the older version.

• List price: *SmartSync*, \$169.95. **Nomadic Systems Inc.**, 650 Castro St., #410, Mountain View, CA 94041; 800-432-1293, 415-335-4310; fax, 415-968-8300.

Circle 403 on reader service card

NEW

DEC Cranks Out Nine New Value-Line PCs

Digital Equipment Corp. has reaffirmed its commitment to delivering low-cost, value-line PCs by introducing nine new models in its DECpc LP family of desktop systems. The DECpc LPv is a slimline PC with three ISA slots, an S3 local-bus graphics accelerator, and 1MB of video RAM. Five Intel 486-based models are available, ranging from an SX/25 to a DX2/66. The DECpc LPx is a full-size desktop PC with six expansion slots, including two VESA local-bus slots. The four 486-based models in the LPx line range from SX/33 to a DX2/66 and come with a choice of S3 or Weitek local-bus accelerators with 1MB of video RAM. The LPx systems also have ZIF sockets for the Pentium processor. All nine PCs come standard with 170MB hard disks and 4MB of RAM, but monitors are not included in the base price.

• List price: *DECpc LPv*, \$1,049 to \$1,799 (monitor not included); *DECpc LPx*, \$1,299 to \$1,949 (monitor not included). **Digital Equipment Corp.**, 146 Main St., Maynard, MA 01754-2571; 800-344-4825, 508-493-5111; fax, 800-234-2298. Circle 405 on reader service card

IMPROVED

Arabesque Quick to Update PIM, Release Low-End Version

The initial reaction to ECCO Professional, **Arabesque Software's** outline-based PIM, was that it was powerful but hard to use. Arabesque has taken two steps to change that: It has enhanced ECCO and has shipped an entry-level edition of another program, ECCO Simplicity. ECCO Professional 1.1 has an improved user interface, with added support for pop-up menus when you hit the right-mouse button. The Calendar view emulates the familiar paper-based Daytimers and includes week-at-a-glance and month-at-a-glance options.

ECCO Simplicity 1.0 begins with an intuitive start-up screen for first-time PIM users that shows just the Calendar, Phone Book, and Outlines views. It comes with profession-specific templates that automatically link data without your help.

New & Improved

• List price: *ECCO Professional, Version 1.1*, \$395 (upgrade for \$14.95); *ECCO Simplicity, Version 1.0*, \$79 through December 31, 1993; \$149 after December 31. Arabesque Software Inc., 2340 130th Ave. N.E., Bellevue, WA 98005-4244; 800-457-4243, 206-885-4272; fax, 206-885-0127.

Circle 406 on reader service card

NEW

CoStar Makes Printing Labels As Easy as Plug-and-Play

The newest member of **CoStar Corp.**'s LabelWriter family, the LabelWriter SE, requires no special software. It works as an ASCII printer, using a modified Epson FX command language and its own built-in fonts to provide plug-and-play operation on any computer that has a standard serial interface.

including a Macintosh. The compact (6.5- by 4.5- by 7-inch) LabelWriter SE has a 2.25-inch thermal printhead that delivers 138-dpi resolution, eight internal fonts from two font families, and five bar code symbolologies. It supports downloadable ASCII characters and accepts bitmapped data, using Epson commands, for printing graphics.

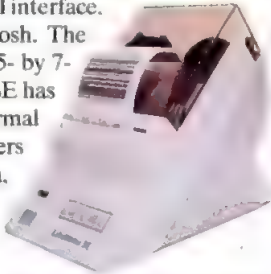
• List price: *LabelWriter SE*, \$499. CoStar Corp., 100 Field Point Rd., Greenwich, CT 06830-6406; 800-426-7827, 203-661-9700; fax, 203-661-1540.

Circle 407 on reader service card

NEW

You Have Two PCs? Connect Them with One-Man-LAN

Networks just got smaller, thanks to **PC InterConnect** and its One-Man-LAN (OML). If you happen to have two PCs that you want to "network" without the network management overhead, install the included 8-bit ISA boards in both PCs, load the software and its 4K device driver, and you can then use one system as a server, perform file transfers, and redirect output to shared printers as if you were on a LAN. The included 8-bit add-in boards provide data transfer rates of 600 kilobytes per second. If you don't want to give up a slot, the base configuration can include two parallel port modules that deliver 300 KBps or 600 KBps,



CoStar's new LabelWriter SE.

BRIEFS

MULTIMEDIA

ATI Technologies has unveiled its CD Sound Dimension Multimedia Upgrade Kit (\$399), which includes a Mitsumi CD-ROM drive, ATI's new Stereo F/X-CD 16-bit sound board with an 8-watt amplifier, and a wealth of applications on two CD-ROMs. The F/X-CD also has a joystick port for use when playing multimedia games. 416-882-2600.

Aztech Labs is shipping its Sound Galaxy Pro 16 Multimedia Upgrade Kit (\$639), which comes with Aztech's new Sound Galaxy NX Pro 16 sound card, a Mitsumi CD-ROM drive, headphones, and five CD-ROM titles including Microsoft Works, Macromedia Action, and Battle Chess Enhanced. The Kit also comes with a wealth of software for functions like multimedia authoring and voice recognition. 800-886-8879, 510-623-8988.

Creative Labs has released its Sound Blaster Edutainment CD 16 (\$749.95) and Sound Blaster Discovery CD 16 (\$649.95) multimedia kits. Both meet MPC Level 2 standards with a 16-bit Sound Blaster 16 audio card and a Creative Double Speed Technology CD-ROM drive with multisession Photo CD capability. Both come with a variety of CD-ROM titles, including The Software Toolworks Multimedia Encyclopedia. 800-998-5527, 408-428-6600.

Megamedia Computer Corp. is shipping the Mega Multimedia Upgrade Kit (\$799) with a Toshiba XM3401B internal CD-ROM drive, a Pro Audio Spectrum 16 sound card, and a set of stereo speakers. It comes with several CD-ROM titles, including Grolier's Multimedia Encyclopedia, 20th Century Video Almanac, Kodak Photo CD Access Software, and more. The kit is MPC Level 2-compatible. 800-634-2633, 408-428-9920.

Reveal Computer Products has introduced three new multimedia upgrade kits, the MFX02 Prestige (\$479), the MFX04 Ultra (\$599), and the MFX06 Elite (\$699). All three come with double-speed internal or external CD-ROM drives, its SoundFX Studio 16-bit sound card, stereo speakers, a desktop micro-

depending on your parallel port. To have a 1,500-KBps transfer rate, you can configure OML with a 16-bit microprocessor-controlled board.

For the enterprising individual, OML can connect more than two PCs at distances of up to 100 feet. InterConnect offers an AC-powered hub with four cable connectors and a parallel port module. OML is compatible with NetWare, NetWare Lite, LANtastic, Windows for Workgroups, and other LAN software. It also comes with Stacker and Super PC-Kwik. Interconnect is planning a One-Man-LAN Economy Package that will compete with LapLink V, as well as a One-Man-LAN for Laptops and Notebooks that will take on pocket LAN adapters.

• List price: *One-Man-LAN*, \$129.95. PC InterConnect Inc., 106 Library Plaza, 15 North 100 East, Provo, UT 84606; 800-374-3880, 801-374-8880; fax, 801-370-3880.

Circle 408 on reader service card

IMPROVED

WinSleuth Gold Plus Makes Analyzing Windows Elementary

The newest in **Dariana Software**'s line of products for installing, configuring, and troubleshooting hardware and software under Windows is WinSleuth Gold Plus. The program

comes with a library of files that give accurate DMA, IRQ, and port requirements to help you install multimedia boards, CD-ROM drives, network cards, internal modems, and other adapters and peripherals. WinSleuth Gold Plus

also provides balloon help, with explanations of technical words, for guiding you through diagnostics.

Other analysis features include motherboard graphics for visualizing the location of bad chips; benchmark tests for disks, memory, video, and processor performance; visual displays that show you where a hard disk platter is starting to fail, with readouts of the track and the number of failures; and the ability to create a safety disk that stores configuration, .INI, and CMOS files. The new WinSleuth supports MS-DOS 6.0, including DoubleSpace, and IBM PC-DOS 6.1.

• List price: *WinSleuth Gold Plus*, \$99.95. Dariana Software Inc., 5241 Lincoln Ave., #B5, Cypress, CA 90630; 800-892-9950, 714-236-1380; fax, 714-236-1390.

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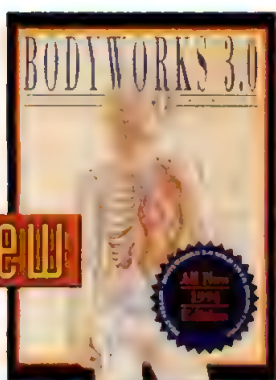
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A You're too busy to read anything else in this ad

You busy on-the-go types will love having Quicken organize your finances the way you organize all your other activities — with the new Quicken Financial Calendar.™ It remembers whom you pay, how much, when, how often — and makes the register entries for you automatically.

Whether the bill is a 36-payment car loan or a 360-payment mortgage, a twice-a-year property tax bill or your every-month phone bill — schedule it just once on the Financial Calendar, and you never have to enter it again. (You can confirm the amount each time if you wish.) And your regular deposits — weekly paychecks, monthly interest, whatever — are just as easy and convenient to handle automatically.

The Quicken Financial Calendar. It just may be the most radical planning-and-organizing tool since... well, the calendar.

B You just like knowing where your money goes

New QuickReports are just for you. Zoom out from any individual transaction in a register to see instantly when you last paid that bill or get a list of all transactions for that payee or category. It's like getting an instant "mini-report" any time you need it.

And for the first time ever, new Quicken 3 for Windows even forecasts your future. The new financial planning graph projects your account balances, cash flow and net worth for the next month — or up to the next



This could be the biggest breakthrough in Quicken ever! Just "drag and drop" transactions to the correct dates. Then let the new Quicken Financial Calendar make all your regular register entries for you automatically from now on. Or, you can put any transaction on "total automatic" and never look at it again — or you can be prompted each time to confirm (or change) the amount. You can also make one-time register entries with the Financial Calendar.

two years — based on the transactions you've scheduled onto the Financial Calendar.



Use this graph to play "What If..." and see the precise impact that decisions like saving more, vacationing sooner or even eating out less will have on your future account balances.

C You don't just organize — you analyze in detail.

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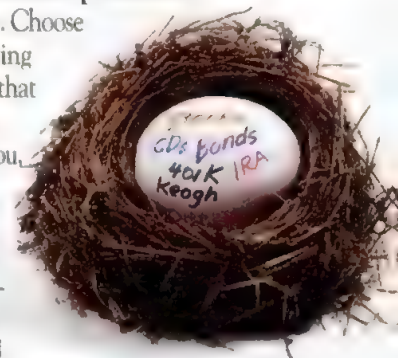
You can also copy reports to the Windows™ clipboard in tab-delimited format, for easy import into your spreadsheet or other Windows applications.

D You plan to retire someday (Or you're already retired.)

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The new investment portfolio view provides instant comprehensive analysis of your investments' performance and value. Choose the investing measures that mean the most to you, from at least 14 different options — including estimated income, ROI, percent yield, and much more.

And now it's much easier to enter new investment activity, too. Just fill out the new onscreen investment activity form. It prompts you for the specific information relevant to virtually any investment transaction.



Quicken upgrades following people:

You love Quicken's speed and ease

The new amount field calculator is radically different — and it's the most convenient onscreen calculator ever. Just type any equation (such as "2.75 + 4.95 x 1.08") directly into the Payment or Deposit column, and it enters the answer for you automatically.

And the new date field calendar makes date entry easier than ever, with no typing.

Plus: backup is automatic in Windows now as well as DOS.

Your Quicken is more than two years old

If you've been too busy to upgrade lately, you've been missing some very popular new features. Like QuickFill™.



Plus IntelliCharge™ electronic credit card statements. And the innovations in QuickZoom™, financial reporting and investment tracking we've mentioned all build on literally hundreds of earlier new features and enhancements. Like loan amortization, financial planning calculators and better links to tax packages, to name just a few.

And learning new Quicken features is easier than ever, too — with new Qcards™ to guide you step by easy step.

You don't (and won't) do Windows

New Quicken 7 for DOS has its own way of doing just about everything we've

mentioned for Windows, plus special features which DOS users in particular will appreciate. For starters, your graphs look better, work harder, and you can print them out, too.

New QuickZoom for graphs shows the "numbers behind the pictures." So you can press



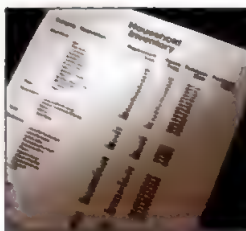
"enter" on the graph of your May expenses, for example, and zoom to a pie chart breakdown on them.

"Enter" again on any piece of that pie, and zoom to the transactions behind it. Yet another "Quicken easy" way to answer your questions fast!

To name just a few more items: Now you can save multiple budgets. And new Quicken 7 for DOS also remembers your last transaction so you can get to it in an instant. There's much more. We're as committed to DOS as you are.

You can never be too organized

Windows users: Introducing new Quicken Companion™ 2 for Windows — featuring the new Quicken Home Inventory™.



It organizes all your household possession records in one place, in about an hour. Just scroll through the "reminder list" and click on "your" items, keeping or

changing the average replacement values as you go. Now you've got a complete insurance coverage report to help you make informed insurance decisions, and provide solid claim backup, too.

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New Canadian editions of new Quicken 7 for DOS and Quicken 3 for Windows are shipped to all Canadian addresses. New Quicken 4 for Macintosh is available now! If you're not delighted with any Intuit product, simply return it within 60 days for a full refund. Quicken is a registered trademark and Quicken Companion, Financial Calendar, Quicken Home Inventory, QuickZoom, QuickFill, Qcard, and IntelliCharge are trademarks of Intuit. Windows is a trademark of Microsoft, Inc. DOS, Windows and Mac feature sets vary. Foreign shipping additional. ©Intuit 1993.

DOS System Requirements: 100% IBM® compatible PC with 640 RAM, DOS 3.0 or higher, and a hard disk drive. Graphs require graphics card. Guaranteed to work with your printer or monitor, or your money back.

Windows System Requirements: 100% IBM® compatible PC, 286 or higher (386 recommended), Windows 3.1, 2MB RAM and 5MB free on your hard disk. Quicken Companion requires additional 2MB free on your hard disk. Works with any printer or monitor supported by Windows 3.1. Quicken 7 for DOS and Quicken 3 for Windows are file compatible.

New & Improved

NEW

Info Products Introduces Three Sheet-Fed Scanners

To complement its line of hand-held scanners, **Info Products** has introduced three new low-cost Image Reader sheet-fed scanners. The \$499 Image Reader SF-300 is an 8-bit, 300-dpi black-and-white scanner that ships with OCR software, while the \$599 SF-3GS is an 8-bit, 300-dpi gray-scale scanner that comes with both OCR and image-editing software. On the high end is the \$899 Image Reader SF-6C, a 24-bit, 600-dpi color scanner that comes bundled with OCR and image-editing software. Each scanner has a small footprint of just 9 by 13 inches. They scan sheets up to 8.5 by 14 inches in size. Info Products also provides HP ScanJet Plus emulation drivers and Twain drivers for all three Image Reader products.

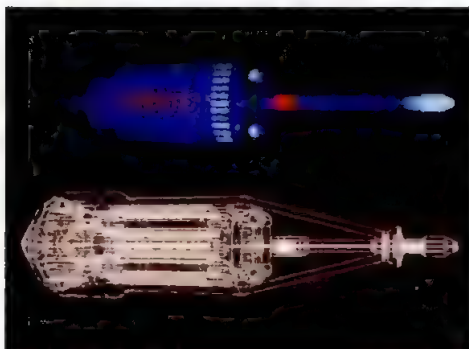
• List price: *Image Reader SF-300*, \$499; *Image Reader SF-3GS*, \$599; *Image Reader SF-6C*, \$899. Info Products, 541 Division St., Campbell, CA 95008; 800-775-7576, 408-374-7290; fax, 408-378-1068.

Circle 410 on reader service card

NEW

Autodesk Ships Photorealistic Rendering to AutoCAD 12 Users

Autodesk has announced a new AutoCAD Development System application called AutoVision that provides users of AutoCAD Release 12 with photorealistic rendering capabilities. With AutoVision's features, you can make AutoCAD models appear as they would in real life. The Materials Editor lets you modify or create your own materials and control their appearance; the Lighting Control lets you simulate real lighting conditions; and the Sun Locator uses latitude coordinates and solar time or a world reference map to portray the



Autodesk's AutoVision application makes AutoCAD models look true to life.

BRIEFS

MULTIMEDIA

phone, and a combination headset and microphone. The number of CD-ROM titles increases as you go up the line, with the MFX06 Elite containing 20 titles and a joystick. 800-326-2222

Proton Corp. is shipping the Proton FM-1561A Multimedia Monitor (\$799), a 15-inch flat-screen monitor with built-in, side-mounted stereo speakers and an amplifier. The FM-1561A provides a maximum noninterlaced resolution of 1,280 by 1,024. It also has a headphone jack with volume control. 310-404-2222.

Diamond Technologies is offering the DT 486C-40 Multimedia PC (\$2,359), based on the new Cyrix Cx486S/40 processor and VESA local-bus architecture. It includes a 250MB hard disk, a Toshiba CD-ROM drive, and a 16-bit sound card. The system comes with 8MB of RAM, a 32-bit local-bus disk controller, and 2MB of video RAM. 800-989-7253, 714-252-1008

Micro Express has added two multimedia systems to its MicroFLEX-VL line. The MicroFLEX-VL/S/Multimedia (\$3,250) is based on the Cyrix Cx486S/40 processor, while the MicroFLEX-VL/66/Multimedia (\$3,650) is based on the Intel 486DX2/66. Each system comes with a Texel CD-ROM drive, a Pro Audio Spectrum 16 sound card, and LabTech stereo speakers with a microphone; each also has a 340MB hard disk, 16MB of RAM, a 256K cache, and a 15-inch monitor. 800-989-9900, 714-852-1400.

INVESTMENT SOFTWARE

MarketArts is shipping Version 2.1 of Windows on Wall Street (\$295), its slick Windows-based investment analysis software. Its Personal Investment Assistant lets you download data from on-line databases, then plot various charts in multiple windows and generate buy and sell signals. The program has a built-in spreadsheet, so you can edit and update historical data. The Windows interface makes it easy to plot trends and print attractive charts. 800-998-8439, 214-783-6791

Reality Technologies has announced Reality's Smart Investor Network by

intensity and angle of the sun at different times of the day and year.

AutoVision will read and write 3D Studio files, so you can combine photorealistic rendering with animation. It also comes with a CD-ROM that contains hundreds of textures and materials that you can apply directly to your model or modify with AutoVision's tools.

• List price: *AutoVision, Version 1.0*, \$795. Autodesk Inc., 2320 Marinship Way, Sausalito, CA 94965; 800-879-4233, 415-332-2344; fax, 415-331-8093.

Circle 411 on reader service card

IMPROVED

Futurus Overhauls Its Workgroup Software Product

Futurus Corp. is shipping Version 3.0 of its powerful DOS and Windows workgroup software program, Futurus Team DOS/Windows Combo, with a host of new features and enhancements for improving ease of use. Futurus Team's e-mail module now includes a fully integrated spell-checker. A new print queue manager lets you direct output from Futurus and non-Futurus applications to files, queues, or local ports, and manage all print jobs. Version 3.0 also has a new Futurus Desktop Padlock that secures your PC when you're away from your desk, while allowing applications to run in the background.

The new Futurus Team has a Visual Desktop that uses objects to link Team modules together for quick and easy access. There's also a new User Group Maintenance Module that gives you graphical tools for managing users, groups, resources, and remote links. Futurus Team 3.0 supports HP-compatible laser printers for printing schedule reports, including a special triple-fold format.

• List price: *Futurus Team DOS/Windows Combo, Version 3.0*, five users, \$649 (upgrades range from \$15 to \$25 per user). Futurus Corp., 211 Perimeter Center Pkwy., #910, Atlanta, GA 30346; 800-327-8296, 404-392-7979; fax, 404-392-9313.

Circle 413 on reader service card

NEW

Chinon, Texel Ship Double-Speed External CD-ROM Drives

Chinon America has unveiled its first external double-speed CD-ROM drive, a powerful multimedia drive with a large 256K cache for ensuring uninterrupted data display. The CDX-535 transfers data and video at 300 kilo-

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CIRCLE 067 ON READER SERVICE CARD



New & Improved

bytes per second and audio at 150 KBps, while achieving an average access time of 250 ms. The front-loading caddy system reads standard CD audio disks, as well as multisession Photo CD and CD/XA extended architecture disks.

Meanwhile, **Texel** is shipping its double-speed DM-3028 internal and DM-5028 external CD-ROM drives, which use proprietary technology to achieve a 335-KBps transfer rate and an average access time of 240 ms. The Texel drives also support multisession Photo CD and CD/XA. All three drives, including the Chinon drive, support the new MPC Level 2 specification.

- List price: *Chinon CDX-535*, \$895. *Chinon America Inc.*, 615 Hawaii Ave., Torrance, CA 90503; 800-441-0222, 310-533-0274; fax, 310-533-1727.

Circle 414 on reader service card

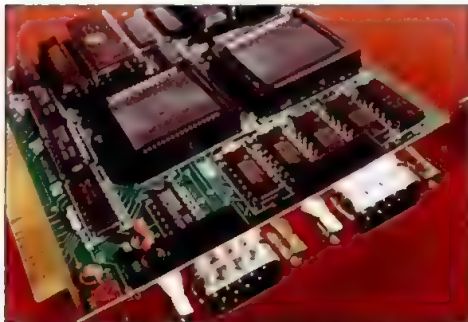
- List price: *Texel DM-3028*, \$499; *Texel DM-5028*, \$599. *Texel*, 4255 Burton Dr., Santa Clara, CA 95054; 800-886-3935, 408-980-1838; fax, 408-986-1010.

Circle 415 on reader service card

NEW

Telcor Puts Two High-Speed Serial Ports on One Card

Because high-performance 16550 UART serial ports still require attention from your PC's CPU, there's a market for add-in serial adapters that can provide sustained transfer rates of 115.2 kilobits per second. The latest entry is **Telcor Systems' T/PortTwin**, which features two serial ports, each with its own processor and 16K send/receive buffer, for an inexpensive \$139. Now you can send and receive data and faxes in the background without hin-



The T/PortTwin has two serial ports that are both managed by their own processors.

dering foreground applications at all, and the 16K buffer virtually eliminates data loss. Since the T/PortTwin uses no IRQ lines or DMA channels in Windows, there are no hardware conflicts.

- List price: *Telcor T/PortTwin*, \$139. *Telcor*

BRIEFS

INVESTMENT SOFTWARE

Money Magazine (\$49.99), with its new Personalized News Clipping Service, which automatically searches a variety of on-line sources to retrieve news items that pertain to your personal investment interests. **Smart Investor** also provides updated quotes, automatic portfolio updates, historical pricing charts, and an on-line discount brokerage. The first month of on-line service is free; thereafter it costs \$17.95 per month to access all the features. 800-346-2024, 215-277-7600

Charles Schwab & Co. is shipping an innovative new Windows program called **StreetSmarts** (\$49.95) that basically allows you to be your own stock broker, 24 hours a day. Using the **StreetSmarts** program, you dial into Schwab's mainframe computer, download up-to-the-minute stock quotes, and place orders on-line. You need to have a Schwab account in order to use **StreetSmarts**, but once you have both, you can save 10 percent on standard commission fees. 415-627-7000

The Vanguard Group of Investment Companies has also introduced a software program to add value to its investment services (though you don't need to open a Vanguard account). The **Vanguard Retirement Planner** (\$17.50) is an interactive DOS program that uses a worksheet model to create multiple scenarios and answer "what if" questions. The program uses graphics to illustrate your financial situation and suggests steps you can take to reach retirement goals. 800-876-1840

Telescan offers **QuoteLink** (\$29.95), a simple interface software package that lets you download investment information from Telescan's on-line database of stock quotes and investment news and dump it directly into a variety of analytical, financial, and spreadsheet programs. Telescan gets its data from sources like Reuters and Comtex; it typically charges \$25 per month (connect times also apply) for unlimited downloading during non-prime-time hours. Other subscriptions are available. 800-324-8246.

Systems Corp., 4 Strathmore Rd., Natick, MA 01760; 800-826-2938, 508-653-3995; fax, 508-651-0065.

Circle 416 on reader service card

NEW

Windows Shareware Hits the Streets at a Smart Price

Some of the latest Windows shareware utilities to make a splash in the retail market are from **Martinsen's Software**. The most intriguing is **Beyond Windows Exit**, Version 1.5, which enhances the way you run advanced DOS applications under Windows by quickly exiting Windows when you choose a DOS app, running the program, then automatically restarting Windows when you exit. **Beyond Windows Exit** comes in handy when you want to run large, complex DOS applications that won't run under Windows.

INI Manager, Version 2.00.02 manages all your .INI files, automatically backing up the files and updating all applications that use an .INI file. For programmers, **PackIt!**, Version 1.11, gives you a front-end to Microsoft's **COMPRESS**.EXE and **EXPAND**.EXE programs, with drag-and-drop, compression reports, and more.

- List price: *Beyond Windows Exit*, Version 1.5, \$15; *INI Manager*, Version 2.00.02, \$25; *PackIt!*, Version 1.11, \$20. *Martinsen's Software*, 5501 Tullis Dr., Building 2, #304, New Orleans, LA 70131; 504-394-6045; fax, 504-391-0164.

Circle 417 on reader service card

NEW

16 Gigabytes: DAT's the News from WangDAT

The storage capacity of DAT drives just took another leap forward. **WangDAT** is shipping two new 3.5-inch drives that can store up to 16GB of data. The \$1,465 **Model 3300DX** stores 4GB of data, while the \$1,660 **Model 3400DX** stores 8GB, or up to 16GB using built-in data-compression hardware. Both drives double the data-transfer rate of their predecessors, with the **Model 3400DX** achieving a maximum throughput of 1.5 megabytes per second.

Also on the way from WangDAT is a DAT autoloader that can hold up to four tapes for a total of 32GB of storage. Its price is expected to be around \$5,000.

- List price: *WangDAT Model 3300DX*, \$1,445; *WangDAT Model 3400DX*, \$1,660. *WangDAT*, 140 Technology Dr., Irvine, CA 92718; 800-992-9916, 714-753-8900; fax, 714-753-8047.

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COMPATIBLE WITH: SOUND BLASTER SOUND BLASTER PRO MICROSOFT WINDOWS SOUND SYSTEM COVOX SPEECH THING DISNEY SOUND SOURCE ADLIB	YES YES YES YES YES YES YES	YES NO NO NO NO YES YES	YES NO NO NO NO YES YES
MULTIPLE CD-ROM INTERFACES (AT-BUS): PANASONIC MITSUBISHI SONY* (adapter required)	YES YES YES YES	YES NO NO NO	NO NO NO NO
CD-ROM INTERFACE (SCSI)	OPTION TO UPGRADE!	NO	YES
OPTION FOR UPGRADE TO 16-BIT WAVE-TABLE SYNTHESIS	YES	YES	NO!



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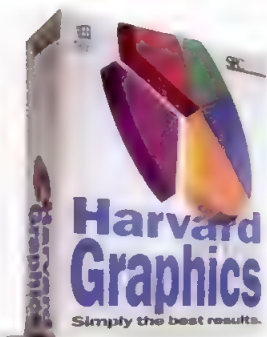
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CIRCLE 318 ON READER SERVICE CARD

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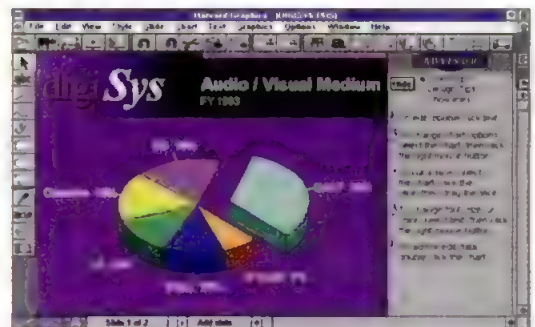
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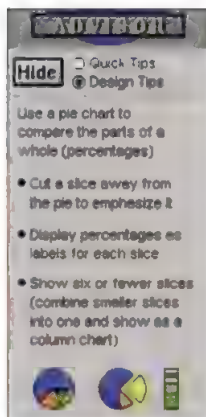
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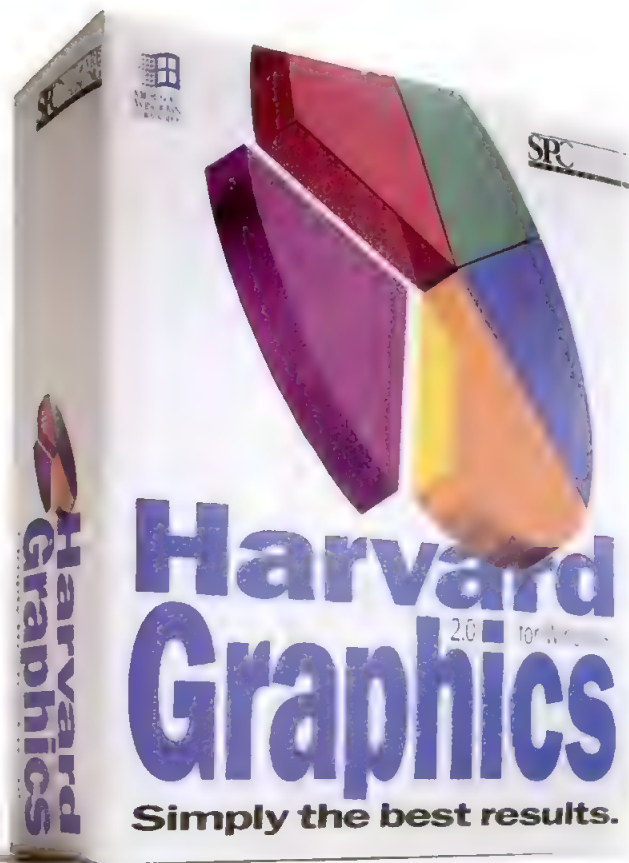
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SPC SOFTWARE
PUBLISHING

Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Lance Ulanoff

IBM's Story: Shades of Black and Blue

BY AL SHAPIRO

Already the subject of Silicon Valley gossip, Paul Carroll's first book is a sensationalized account of IBM's corporate fortunes, which paralleled the success and failure of IBM's personal computer. Much of that history, according to *Big Blues: The Unmaking of IBM*, is really the story of the technical and business acumen of William H. Gates III and the bureaucratic failings of IBM.

Carroll is devastating in his characterizations and criticism. One frequent target is Bill Lowe, once the head of IBM's Entry Systems Division (the group responsible for the PC and the PS/2) and later an executive at Xerox Corp. He is referred to as "the Gerald Ford of the computer industry."

Like a good novel, this insider trashing of IBM is a fast, colorful read, with Carroll dishing out one spicy anecdote after another. Unfortunately, the book is sometimes just as fictional as a novel. Because IBM never "cooperated" with his writing—providing neither primary documentation nor even verifying information—Carroll pieced together his story mainly from interviews and industry lore. The author had to

rely mainly on accounts by outsiders or ex-IBMers that were one-sided, and in many cases disingenuous or misinformed. The book has an overall "iffy" quality with quoteless quotes,

minimum footnotes, and only a dozen books in its bibliography.

Carroll does get most of his facts right, but surprisingly misses some of the more interesting events in this saga. He omits the story of why OS/2 was written in 16-bit code, neglects most of the international divisions of IBM, and equates its PC business, which represents about a tenth of its revenue, to the success of the entire corporation.

Most importantly, he offers little insight into the lessons to be learned from his close observations of IBM over the better part of a decade.

• **Big Blues: The Unmaking of IBM**, by Paul Carroll, \$24.00. Crown Publishers Inc., 212-572-2537; ISBN:0-517-59197-9.

Circle 401 on reader service card

Author Paul Carroll quotes a song about former CEO John Akers that reportedly circulated within IBM:

"Some employees began circulating a rap song about the man who was now widely called John Fakers.

Every morning at Armonk you could see him arrive

In a fancy car that a chauffeur would drive.

Kind of big in the wallet and narrow in the mind.

And every VP knew how to kiss the behind of Big John.

Big John, Big John, Big bad John."

—*Big Blues: The Unmaking of IBM*, page 329



Another Business Antidote?

BY MATTHEW J. ROSS

Corporate America is in trouble. Beset with increasing international competition, a mass market shrinking in the face of specialization, and pickier consumers, American businesses lack the skills necessary to thrive in today's technology-dominated world, say authors Michael Hammer and James Champy. Their advice? Adopt radical change.

In their book, *Reengineering the Corporation*, Hammer and Champy tout "reengineering" as that tool of change, challenging

the myth that a person can perform only one task at a time.

At the heart of reengineering is the enabling role of information technology. Today's multiuser databases permit information sharing that shatters the idea that work must be performed sequentially, and encourages concurrent product design, production, and marketing. Expert systems empower workers to make decisions, while freeing management to pursue new ideas. And reliance upon today's (and tomorrow's) computer technology speeds work processes while minimizing costs.

If all this sounds like business school jargon, Hammer and Champy also combine real-world reengineering success stories and case studies with a careful explanation of the basic concepts be-

hind this new approach to business organization. The book includes frequent case studies that

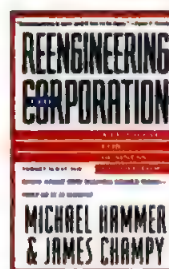
feature the words of each company's reengineering leader.

The authors begin by examining the current state of American business and its history. Then they break down the process of transforming a typical corporation into a new company of empowered employees.

Reengineering the Corporation suffers from undue repetition at times. But in general it is an easy and compelling read. Overall, it's an important book for today's success-hungry managers, and it leaves you hungry for more.

• **Reengineering the Corporation: A Manifesto for Business Revolution**, by Michael Hammer and James Champy, \$25.00. Harper Business, 800-331-3761; ISBN: 0-88730-640-3.

Circle 402 on reader service card



PROGRAMMER'S TECHNICAL REFERENCE:

Read Only Recommends

This is a useful high-level look at communications architecture. *Programmer's Technical Reference: Data and Fax Communications*, by Robert L. Hummel, \$39.95, Ziff-Davis Press, 510-601-2000; ISBN 1-56576-077-7

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Speed Up C/C++ Programs With Spontaneous Assembly

BY RICK KNOBLAUGH

With its melding of low-level power and high-level readability, C/C++ is the language of choice for many programmers. But when program size and speed are critical, nothing can compare with hand-optimized assembly language. Even if you don't know assembler, you can tap the strengths of both languages with Base Two's Spontaneous Assembly for C/C++. Over 900 assembly language functions and macros, callable from C, ease such tasks as developing TSRs or device drivers, adding a data compression engine, or creating text-mode, overlapping windows. There is even a set of functions for cooperative multitasking under DOS. Full assembly language source code is included.

The routines are provided in highly granular libraries so you can link in only those that your program requires. The typical C/C++ method of passing parameters on the stack is implemented through optional C library binders—front-ends to the assembly language libraries. Or you can use in-line assembler to call the libraries directly, passing parameters through registers. Both calling methods can be used within a program, so you can use the more efficient but less readable in-line assembly method only when speed or code size is critical.

COMPRESSION, TSRs AND MORE

Some of the functions in Spontaneous Assembly are smaller, faster versions of standard C

runtime library functions. There are functions for console I/O; memory management; string, array and buffer manipulation; conversion of data types; scripted I/O; and file and directory handling. Often the Spontaneous Assembly versions add additional functionality. For example, the scripted I/O functions provide more options than printf() for formatting numbers, and let you draw borders and change display attributes.

The Spontaneous Assembly libraries also offer some very impressive advanced features, including data compression, TSR and device driver creation, a multitasking kernel, and text-mode windowing. The data compression engine is adapted from the public domain LZ77 sliding window algorithm. Variables controlling window length, look-ahead length, maximum Huffman tree weight, and hash size can be automatically determined or manually fine-tuned to balance compression ratios and performance. Utilizing the compression engine in your program is as simple as adding a few library calls, and the results are quite respectable—somewhere between PKZIP 1.x and 2.x in effectiveness.

Spontaneous Assembly also makes it easier to write TSRs. Macros let you easily generate the structures that control the TSR functions. TSRs can be activated on interrupts such as the timer or DOS Idle interrupt, or

via configurable hotkeys. You can specify that code or data be made resident, transient or swapped to EMS memory. A special interface allows other programs to communicate with the TSR to configure or uninstall it. Best of all, the TSR functions deal with all of the DOS reentrancy issues and error handling. For TSRs that need to pop up on the screen, console I/O support routines make it easy to save and restore the screen contents and video state. As with almost all TSR libraries, however, support is limited to text-mode screens.

The cooperative multitasking functions are useful when it is necessary to schedule and manage multiple tasks within one program. Functions are provided to create, remove, and suspend tasks. You can also prioritize the scheduling of the tasks. To create a task, you supply task descriptor values—stack information, starting address, priority, and other controls. Since the multitasking is cooperative, the programmer is responsible for ensuring that each task makes way for the other tasks to execute.

While not a full-featured user interface library, Spontaneous Assembly does provide a set of functions for creating overlapping, text-mode windows. To create a window, you call a "window create" function and pass a window descriptor—a structure which outlines the window's size and appearance. Using the identifying handle returned from this function, other routines can move the window, select it (make it active), suspend/resume it, and so forth.

All window design must be performed manually; there is no visual editor for automatically generating the window descriptor definitions.

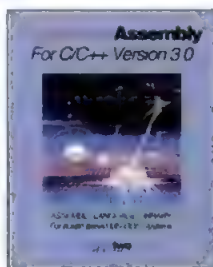
For C++ programmers, Spontaneous Assembly provides a Quad class for signed or unsigned 64-bit integer math—a faster and smaller alternative to floating-point math. With its overloaded operators, the Quad class lets you manipulate 64-bit integers with the same operators that you would use for ints and longs.

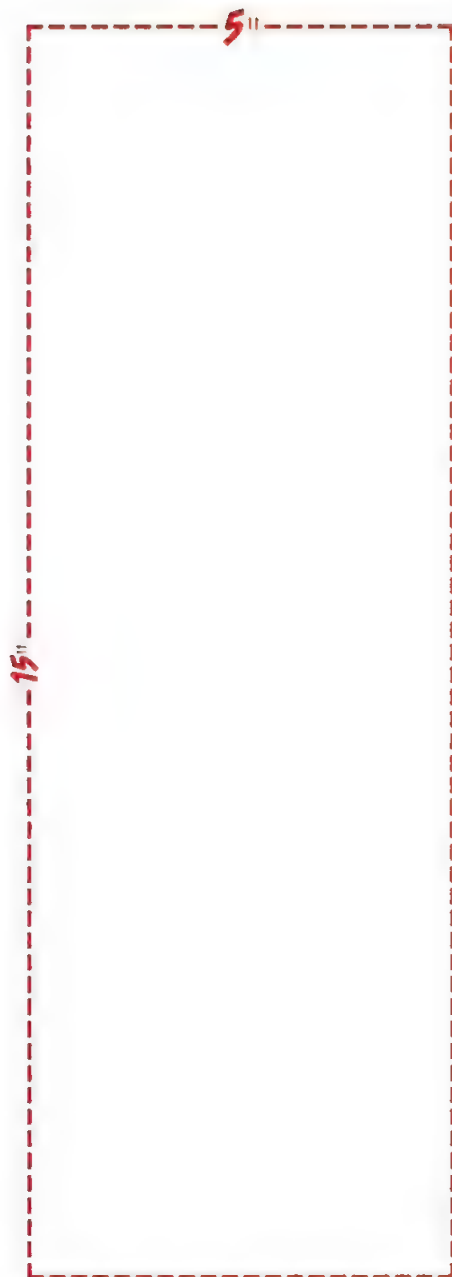
The full source code for the libraries is provided in compacted modules containing related groups of .ASM files. The code is clean, elegant, and well-documented. Headers preceding each source file and function clearly describe the functionality and the input and output specifications. Each function is also thoroughly described in the reference section of the accompanying manuals. In addition to the excellent manuals, sample programs and template files make it easy to get started using the libraries. If you need smaller and faster C/C++ programs and the productivity boost that's gained from canned functionality, Spontaneous Assembly for C/C++ is a good choice for enhancing your development efforts. □

• Spontaneous Assembly for C/C++, Version 3.0

List Price: \$279 (introductory price of \$79 while supplies last). Requires: DOS 2.0 or later; compatible with Borland (2.0-3.1), Microsoft (6.0-8.0), Zortech (3.0), and TopSpeed (3.02) C/C++ compilers. Base Two Development, A Division of Acclaim Technologies Inc., 11 East 200 North Orem, UT 84057; 800-277-3625.

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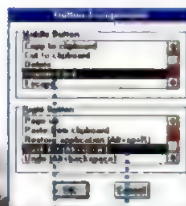
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Michael J. Miller

Software Ain't Heavy, It's the Support

When you're installing a new piece of software and the whole process simply isn't going well, who do you call? Not Ghostbusters. You pick up the telephone and call technical support. If you've got the application running, but it seems to

be conflicting with another application or some part of your hardware, once again, you call tech support. If the package is running fine but you need to understand how to best use it—such as how to design a database for your company or design a presentation that really looks good, whom do you call? Again, tech support.

And that's just what software vendors are afraid of.

More and more, when software vendors think about technical support, they see the words "cost center." They don't view technical support as a way of helping their customers but as a magnet for ever-rising expenses, with little offsetting income in sight.

For most vendors, their installed base is larger than the new market, so many of the people calling technical support are not new customers. What's more, programs are more complex than ever and have to coexist with more applications (often running at the same time) and different kinds of machines. And networking adds yet another wrinkle to this broad cloth. At the same time, the average price of most software is declining, as competitive upgrades become a larger percentage of sales and "special promotions" become a fact of life.

LESS ASSISTANCE

As a result, more and more software vendors are limiting their technical support hours. The once commonplace life-of-the-product free telephone technical support is becoming an endangered species. Today's support is a whole new animal: You get, for example, 90 days or so of free telephone support, with the 90 days starting the day you make your first call. After that period, you can buy "premium" support, either for a set annual fee or on a per-call basis, or both. Also, you can generally

get "free" support from CompuServe bulletin boards. But then, who says that a CompuServe membership is free?

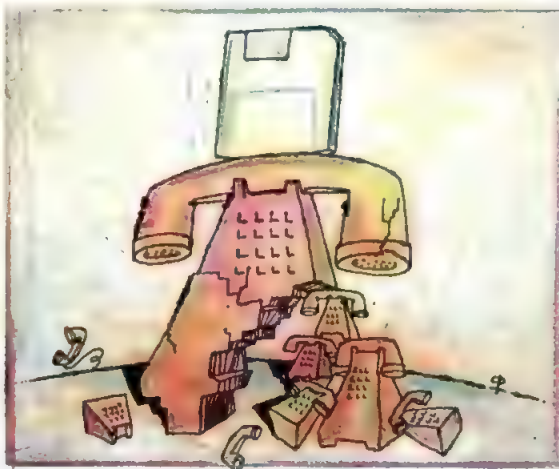
Lotus Development has been using this policy for most of its products for some time; now other companies, including Microsoft Corp. and Software Publishing Corp., are following suit. The justification is that while most developers understand they have an obligation to help the customer, they also believe that most of the questions come within the first 90 days.

The basic philosophy is simple: You pay for the support you need. If all you need is CompuServe and phone support during installation, that's already included in the base price. If you need occasional additional support, that's a bit more. If you're running a big company and want to be completely covered for any technical support question that comes up, there's an annual fee. My colleague Robin Raskin calls this "object-oriented support" because every level represents a different support option (or object) for the user and yet another support object opportunity for the vendor.

On the face of it, this sounds reasonable. If I want

more service, I should expect to pay for it. Still, if these are the new rules, then we, as users, should expect more fair play from vendors.

Our first request would be for full disclosure—to make sure that we all understand the policies and the costs. It would be nice to see a listing on the software box, or in the ads, spelling out the entire policy. This could be as simple as "90 days support free, additional telephone support \$25 per call or \$100 a year." Most people I talk to expect free support and are surprised when the new fees come in. This



The burden of software product support shall inevitably become a shared one.

Michael J. Miller

would at least eliminate the surprise.

We, as reviewers, are also going to have to pay more attention to the support policies and fees that most companies charge. We need to make it easier for customers to understand the differences. For instance, Microsoft Word for Windows lists for \$495; the last upgrade cost \$149; and standard technical support is available, free, 12 hours a day, on a toll line. WordPerfect also lists for \$495; its last upgrade cost \$129; but technical support (for now, at least) is not only free but *toll-free*. Made clear, that difference might influence how someone views the cost of a product.

Our second request would be, of course, that when we do call the number, we get the support we are paying for, whether it is "priority service" or regular service. That's why we at *PC Magazine* have been tracking customer satisfaction with support for both hardware and software, and will continue doing so. (See our July 1993 issue for details).

WHAT A CASE

Beyond this, the policies have to make sense and reflect the target audience of the product. Packages such as NetWare, AutoCAD, or Oracle 7 tend to be installed by VARs or experts who provide the support. Such support usually covers not only the software but adds insight for the application's intended purpose. It also tends to be expensive. This scenario, however, does not hold true for most productivity applications or general-purpose operating systems.

That's why I was surprised to hear about the new support policies for Microsoft's Windows NT. Although Microsoft consistently maintains that NT is intended for high-end corporate use, the upgrade for Windows 3.1 sells for just \$295. And the chasm between the price and Microsoft's intentions widens when one looks at how NT is supported. Beyond the 30 days of initial free support (a policy only recently extended until June 30, 1994) Microsoft charges \$150 per incidence (on a toll-free line), or \$7,500 a year. Perhaps this is reasonable for Advanced Server or SQL Server, but it seems out of line for a product that looks like it's relatively inexpensive—and as if it may also involve a nontrivial installation.

By contrast, OS/2 costs \$249, with a \$110 upgrade from previous versions; it has 60 days free support and an 800 line (IBM officials say they have not charged anyone beyond the first 60 days, but a new, more stratified support policy may be in the offing).

Installation support, of course, is crucial. Without it, the whole software industry would be suspect. Imagine: You try to install Windows NT, but for some reason it doesn't work. You try to call the company, but they want \$150 to get your system working again. It all sounds a little too much like the old horror stories of drug dealers who give away the first sample just to get you hooked. But that would imply that software vendors are trying to make real money by holding people's data hostage—something that, I'm sure, isn't intended.

Barring such nonsense, I know why software vendors need to charge for support. But still, I hope there's always room for the companies like WordPerfect, which view support not as a cost center but as a way of communicating with their customers and building customer loyalty. WordPerfect may not be able to maintain its tradition of free (and toll-free) support indefinitely, but it sure is nice while it's lasting. □

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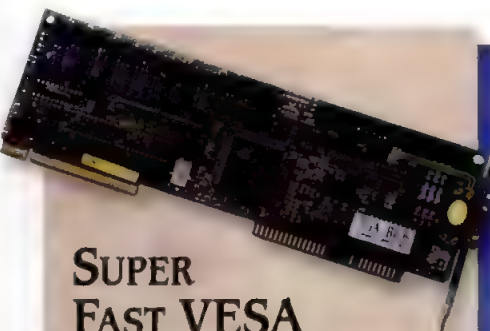
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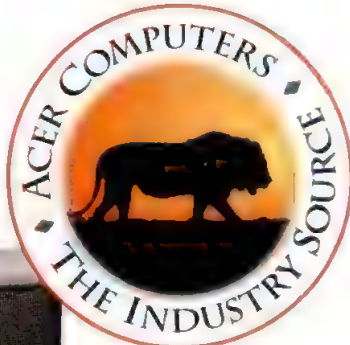
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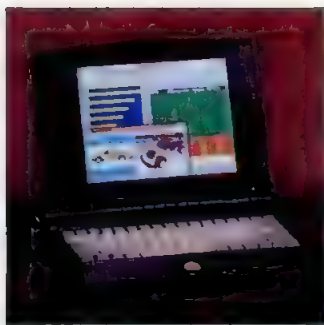
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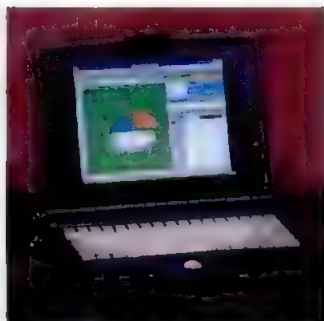


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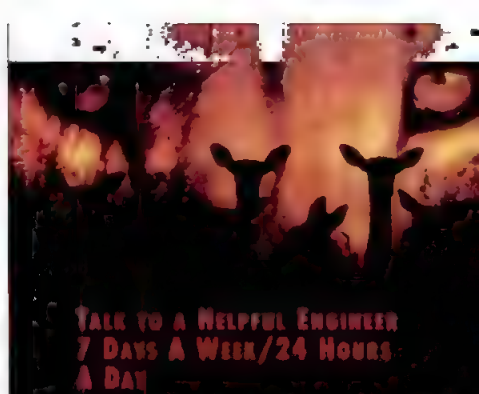
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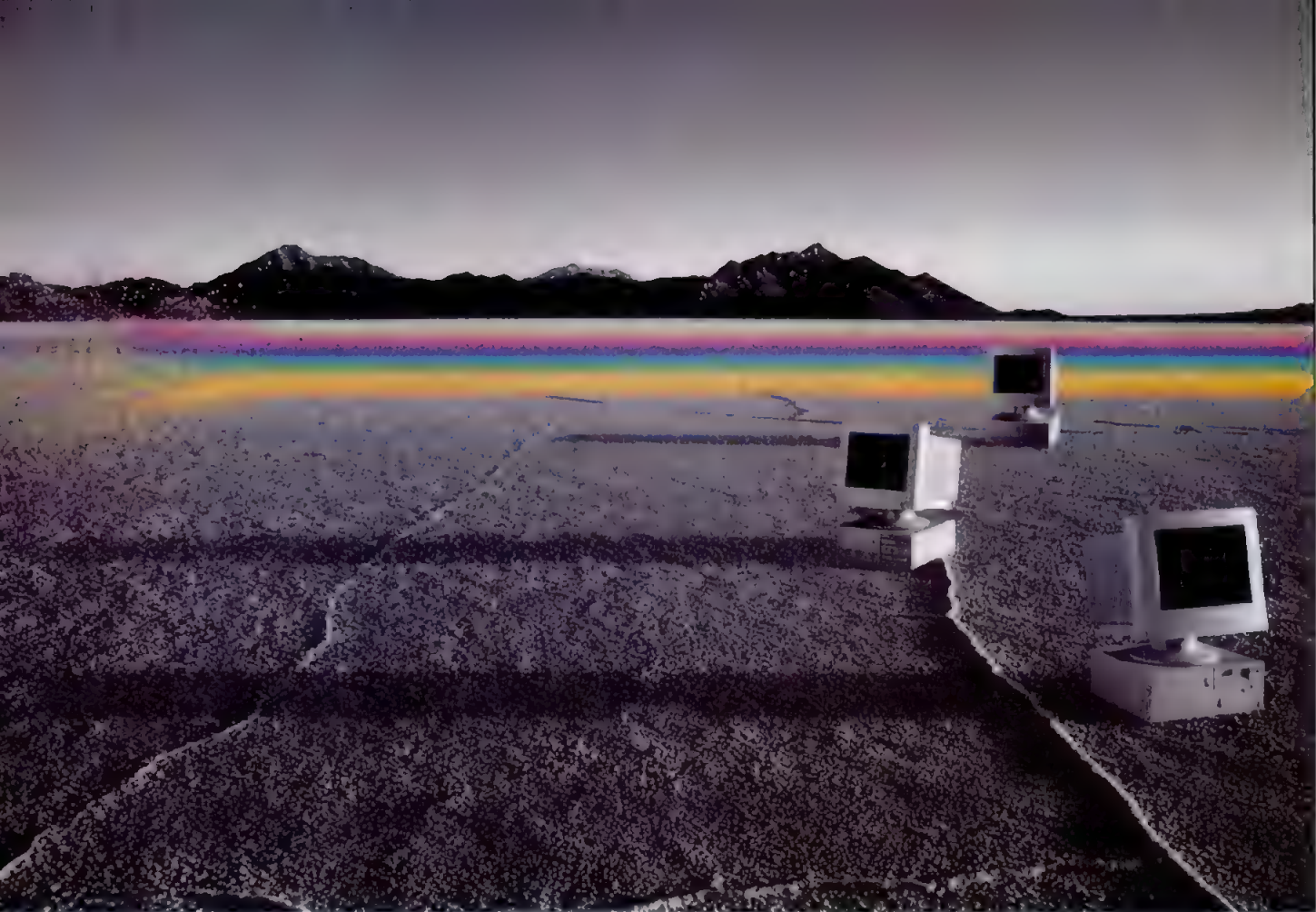
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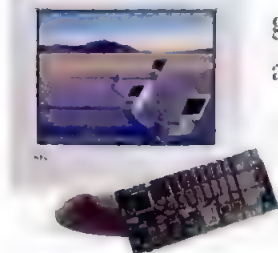
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Tests performed using Ziff Davis Labs' WinBench V.3.11 without independent certification by Ziff. Media Vision conducted all tests based on Diamond motherboard with Intel 486DX2/66 CPU, 16MB RAM, 256K cache, 340MB IDE hard drive, MS-DOS Version 5.00. ©1993 Media Vision, Inc., 3185 Laurelview Court, Fremont, CA 94538. (510) 770 9592. Pro Graphics 1024 is a trademark of Media Vision, Inc. Any other trademarks and registered trademarks are owned by their respective holders.



Bill Machrone

What's Wrong with Multimedia

Hear this now: "Interactive entertainment" is the oxymoron of the nineties. You want interactive entertainment? Sail a boat. Dance in a mosh pit. Play chess—against a human opponent. As soon as you bring a computer into the scene, you're

not interacting. You're choosing responses from a menu. You're invoking an algorithm.

A handful of people in the world can beat a computer at chess. How depressing for them. For the inevitable time will come when the algorithms, opening books, and endgames will exceed even the best players' abilities. What, then, will be the challenge of playing a game you cannot win?

Interactive entertainment has adulterated the meaning of multimedia—the M word. Now, there's multimedia and Multimedia. The capital-M crowd has raised multimedia to a level bordering on religious significance. They see a future replete with interactive entertainment: movies, books, television. They hunger for the digital superhighway. They want 500 channels. They want smart decoder boxes on top of your TV so you can interact with their endless offerings. The other crowd sees interactivity as the fastest way to ruin a good TV show. Want to make sure that people stay away from a movie in droves? Give it alternate endings, and let the audience vote on the outcome.

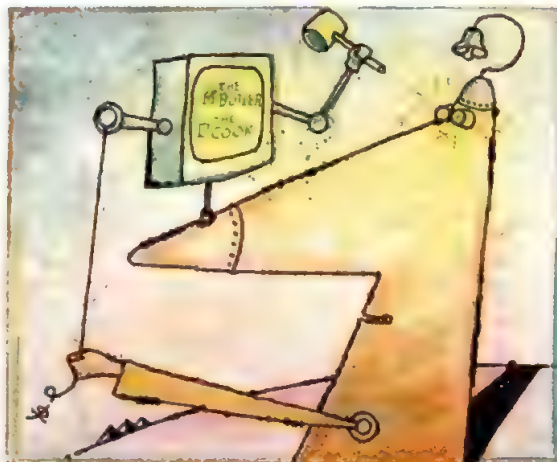
THAT'S ENTERTAINMENT?

Jurassic Park, the Nintendo game, is a flop. What works on the big screen doesn't translate especially well to the small screen. People are willing to sit in a darkened theater and watch the exploitative scientists and lawyers get their comeuppance. But where's the fun in having a little cloud of pixels that vaguely resembles one of the movie's characters endlessly running from the implacable jaws of T. Rex? *Super Mario Brothers*, *The Movie* was a flop, too. Game Boy is a lousy incubator for feature films. How come the producers

were the only ones on the planet who couldn't have predicted it? On the one hand, we're asked to transfer whatever feelings we had for a character and pit them against branching logic and stilted animation routines. On the other, we're supposed to take all that painstakingly developed eye-hand coordination to the theater with us and sit on our muscle memory while listening to inane dialogue from a character who should know that actions speak louder than words.

Crossing from one medium to another is a great Multimedia concept. It's not multimedia, though. It's dumb.

Much of the entertainment on television exists to promote a cataleptic state in the viewer. How dare the Hollywood moguls interfere with one's basic right to zone out for a couple of hours each evening? Yes, there is a kind of stimulation to be had from TV—you can watch endless reruns of *Basic Instinct* on cable. You can find a bottomless pit of puerile and jejune hostility disguised as humor. If that's what you enjoy, fine. Just don't let anybody ruin it by invoking the M word and making it interactive.



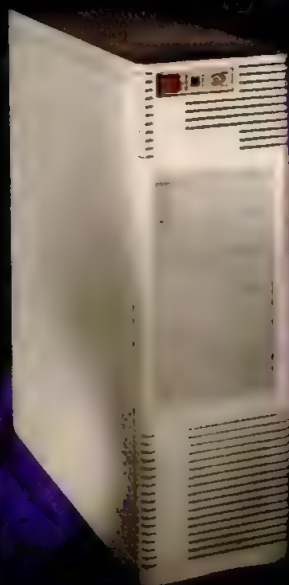
How dare Hollywood interfere with one's basic right to zone out for a couple of hours each evening in front of the TV?

SHOP 'TIL YOU SPEND

Home shopping is Multimedia, not multimedia. It's the last refuge of the time-constrained, the terminally bored, and the agoraphobic. The big concept is that you pick up a phone and call for that gorgeous cubic zirconia ring while watching TV. Someday soon you may press a button on your remote control to make the purchase. One transaction is handled by the phone company and the other by the cable operator.

There are millions of dollars at stake, and everybody wants your business. The telcos want to carry

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Bill Machrone

video; the cable operators want to carry transactions. Both want to install dedicated, proprietary devices in your home that hook to their network and generate more business. Each touts its delivery vehicle for Multimedia as the right one. The barracudas are here to rescue us from the sharks.

Home shopping, with or without the interactivity, may have the last laugh on the esthetes who are pushing for HDTV—high-definition television. You may want to watch movies with more than twice the resolution in their original height-to-width form factor. The need to show merchandise in better detail than TV can currently provide, however, may well be the economic hook that makes HDTV feasible.

THE REAL THING

Real multimedia is alive and well—and available on your desktop. Real multimedia engages, instructs, and entertains in ways that are synergistic, not derivative of other media. You don't need Sonic the Hedgehog to take you on a guided tour of Microsoft's Encarta, the premiere CD-ROM encyclopedia. All you need is your own curiosity and need for information. Random access and linked topics combine with video, audio, and animation to give you unprecedented access to information. All the world's knowledge doesn't fit into a building, much less a 650MB disk, so what you find in any CD-ROM encyclopedia is merely the beginning.

The final, and most important, hypertext link is to the bibliography. If the telcos and cable companies really want to provide a service, it'll be to the Library of Congress and other information providers. Sometimes you'll want words, other times pictures, whether moving or still. Sometimes you'll need detailed technical diagrams and illustrations. Maybe you'll go from knowledge to entertainment, maybe vice versa. Not many people will go from Roger Rabbit to researching public transportation in Los Angeles, but the point is that you can.

Synergy is the key. If it's a force fit and it costs billions, it's Multimedia. If it's innovative and interesting, it's multimedia. Still, the biggies on all sides are covering their bets: The endless, interlocking skein of alliances among hardware companies, software companies, information providers, and service providers is a risky set of hedges against an uncertain future. □

Pixels per second

1,600,000

1,400,000

1,200,000

1,000,000

800,000

600,000

400,000

200,000

0

Close-Up 5.0

pcAnywhere
for Windows 1.0

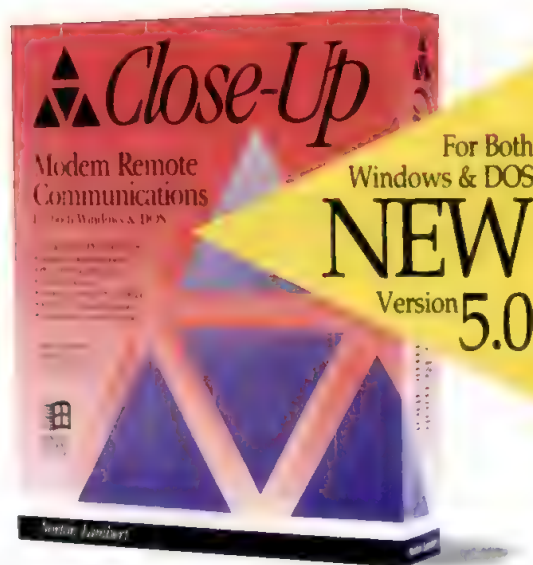
Carbon Copy
for Windows 2.0

WinBench scores
(average of 10 runs):
Close-Up 1,613,118
pcAnywhere 194,093
Carbon Copy 168,397

WinBench™ 3.11 by Ziff-Davis Labs Tests Remote Windows™ Speed

This graph shows the speed of the three leading remote control programs when transferring Windows screens. As you can see, Close-Up handles more pixels, faster, meaning you spend less time waiting for Windows screens.

The industry standard test, WinBench 3.11, is perfect for testing the speed of remotes. It is an accurate measure of video throughput. Video throughput is the limiting factor in remote operations, because remote programs must transmit Windows video functions from one PC to the other.



New Remote Software Sets Windows Speed Record

Communicate Faster & Easier

Close-Up® lets you communicate faster & easier with five exciting technology firsts.

Close-Up is the only remote communications software that won both PC Magazine's coveted "Editors Choice" and PC World's "Best Buy" awards. Now Close-Up has a new faster & easier version that allows you to view and control another PC by modem as if you were there!

Technology Firsts

1. AI Video Compression
2. Photographic Memory
3. Non-Intrusive Technology
4. Expert System
5. Video Translation

Why Is Close-Up So Fast?

Close-Up learns as it works. It uses AI (Artificial Intelligence) to compress all Windows video function calls. That's why Close-Up does so well in Windows

Benchmark tests (see WinBench 3.11 chart).

Close-Up uses its revolutionary Photographic Memory™ so that once Close-Up has seen all or part of

a Windows screen, it's memorized. Then as screens change, Close-Up only transmits new unmemorized data. Incredibly, with this technology Close-Up gets faster & faster the longer you use it.

What Remote Companies Haven't Told You

Other remote programs permanently slow Windows and usually reduce your video resolution and depth of color, even when they are not in memory. That's because they permanently change your system.ini file. Close-Up's breakthrough Non-Intrusive Technology does not modify any of your sensitive Windows files including the system.ini. Close-Up is the only remote that when not in use, allows Windows and your PC to run at normal optimal levels.

Expert System Makes Communications Easy

You don't have to be a communications expert to get the results of one. Close-Up has an Expert System that automatically analyzes system components and configures your system for optimal speed.

Video Translation

With Close-Up, dissimilar PCs can easily connect, because Close-Up senses the video capabilities of both PCs and automatically displays Windows in a video mode compatible with both sides.

Risk-Free Offer!

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We invite you to reproduce this test. We used two identical Gateway 4DX2-66V's with 66-MHz Intel 486DX2-66 CPUs, 16 MB RAM, 256KB RAM cache, 340 MB HD, IDE controller, no hardware disk cache. Video: Local Bus ATI Ultra Pro with 2MB VRAM, 640 by 480 pixels, 16 colors, VGA DRV dated 3/10/92. Monitor 72 Hz. MS-DOS 5.0, SMARTDRV 2 MB cache. Modems: two 14,400 baud V.32bis. WinBench 3.11 is available on ZiffNet accessible via CompuServe. Test performed without verification by Ziff. All products are shipping versions. WinBench trademark of Ziff Communications Co. Windows trademark of Microsoft Corp.

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PC Magazine, Cover Story, Portable PCs, August, 1993

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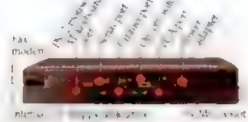
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PC MAGAZINE, Portable Computing Issue, August, 1993

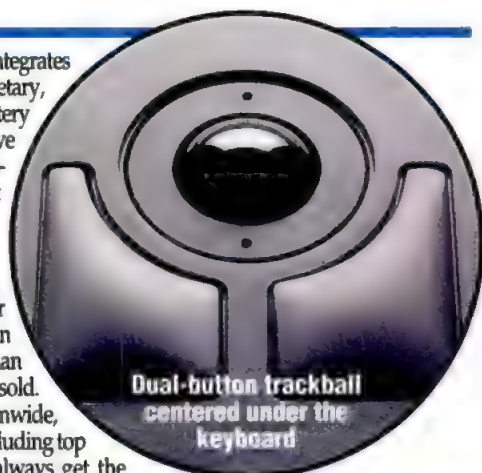
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The new, upgradable, fully-static design SL enhanced Intel 486SX 25MHz chip enables the CPU to operate at a 0MHz low power state. The

WinBook's Pico Power Evergreen chipset integrates battery and power management with a proprietary, open loop heat regulator circuit to extend battery life and prevent heat build-up. Plus, we have fine-tuned the WinBook's screen. In monochrome and in dual-scan STN color—you get sharper, clearer images with less cursor loss.

The WinBook was engineered for Micro Electronics, a division of MEI/Micro Center, Inc. MEI is America's leading direct source for computer products. Micro Center has been selling PCs for more than 14 years—longer than IBM or Compaq—with over 736,000 units sold. With over 2.2 million satisfied customers nationwide, we have developed a superior support staff including top engineers and technical specialists. So you always get the highest quality product at the lowest possible price.



WinBook™

WinBook 486 SX Features



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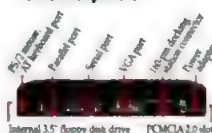
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 - 16mm Aps dual-action
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 - Up to 3 hours with power

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CIRCLE 368 ON READER SERVICE CARD



John C. Dvorak

Game Machines: Trend or Fiasco?

What's in the news? Expensive game machines. There's the 3DO and the Atari Jaguar, and now Silicon Graphics and Nintendo have linked up to promise still another one. Recently Radio Shack rolled out a pricey pseudo-CD-ROM

thingamajig on the heels of the incredibly unsuccessful device from Commodore. All these entertainment devices are doomed to failure.

It doesn't take a genius to look at the progenitor of all these machines—the Amiga—and see that the high-end game world is hopeless. Nobody wants to spend over \$500 for a game machine. 3DO even had the gall to go public before shipping one single unit. And the public gobbled up the stock. Why? The only reason I can fathom is that there's a really, really good list of strategic partners. Yawn. So what? Nowadays anyone with a decent Rolodex can line up so-called strategic partners. Of course, these promoters will tell you the strategic partners are investors as well. Yeah, if these guys are so hot and into it, why did they go public? We're talking about one of the biggest venture capital firms in the world (Kleiner, Perkins) and a company like Matsushita. What do they need public funds for so soon? If you ask me, it sounds like lack of confidence.

Back to my main point. Why this sudden infatuation with high-end game machines?

First, the unit sales of games on the plain old PC have surpassed other categories. People are playing games on the PC, now that sound and SVGA dominate the scene and make game playing at least as fun as it is on the Sega or Nintendo machines.

Second, we all know that a machine designed just for games will outperform a PC.

Third, the people behind all these ideas are getting to be middle-aged fogies trying to recapture their youth. Apparently, the Ferraris and Lamborghinis aren't really *that* satisfying.

Overlooked in this pursuit of lost youth and

greater wealth is reality. Reality is quite simple.

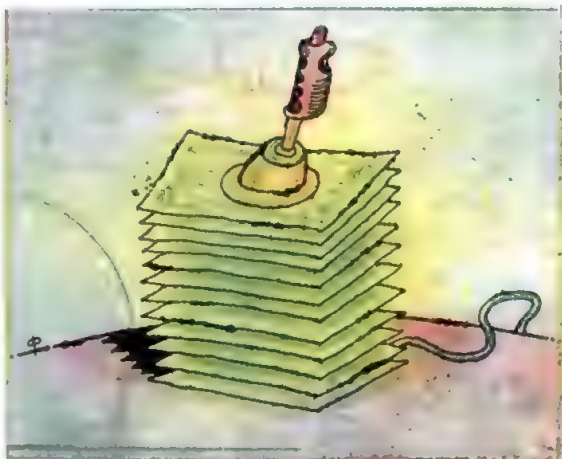
First, people don't want to spend over \$100 on a game-only machine, period. These promoters have no grasp of what consumers can afford. Ask anyone closely involved in 3DO when last they stepped into a Kmart. They're as out of touch as poor George Bush was when he played the Gomer and yelped upon seeing a laser scanner at a grocery store checkout counter.

Second, most of the games appearing on these machines are just ports of games already on Nintendo and Sega. "Oh, but the music is so superior!" Sure, the new machines are superior, but so what? People don't play Sonic the Hedgehog or Super Mario because the graphics and sound are so great. The games don't have to be hi-res with Dolby Surround Sound to be good games. Kids play these games because the games are great.

Third, a super game machine has been tried before and failed miserably. It was called the Amiga. Nobody questions the fact that the Amiga, when introduced, was technologically superior to anything on the market. But it was perceived as a trivial game computer, and that perception killed it. Only when you get to the \$100 price point will the trivial become acceptable.

There's another thing that annoys me. All the hoopla over these machines is a distraction from the mainstream computer scene. I don't like it. Development effort should be focused on multimedia computers, not edutainment (ugh!) titles for the 3DO. And if you have to write a game, there is nothing wrong with the established 16-bit universe of Nintendo and Sega.

If these new game platforms don't do well, there will be a lot of wasted time and even more wasted money. □

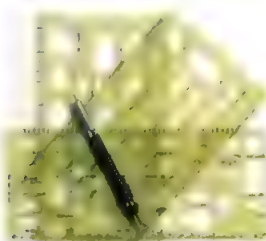


It doesn't take a genius to see that all the hoopla over new game machines is just that—hoopla.



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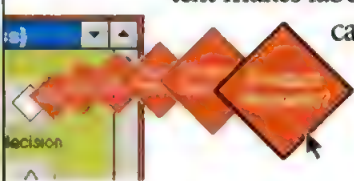


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Inside Track

Long live the GUI running under DOS. If you've been using a bulletin board over the past year, you're already familiar with RIPscrip—the most quickly adopted standard I've ever seen in this industry. RIPscrip, developed by TeleGrafix Communications (phone, 714-379-2131; fax, 714-379-2132; BBS, 714-379-2133), has been used to convert most DOS-based telecom programs and all the up-to-date BBS software packages into mouse-driven GUI systems. It's rather **phenomenal**.

At this year's ONE BBSCON, the definitive trade show for computerized bulletin board sysops and corporations interested in setting up a BBS for their company, I ran into Mark Perkel, the Novell guru. He pointed out to me that with a small TSR or a replacement for ANSISYS, the **entire DOS world could be transformed** into a mouse-driven GUI environment using the technology developed by TeleGrafix. As a bonus, coders who use RIPaint—an elaborate \$200 paint/screen design program—can create all sorts of fancy screens, too. "The beauty of RIPscrip," Perkel told me, "is that the conversion process is effortless. I could convert my Novell menuing system in a week-end to be a fancy GUI program."

While the on-line community is up and running with this new standard, the general computer community is **flat-footed**. My advice: Find out more about this software by contacting the company and getting them to send you a demo disk and some literature. **It's a sizzler!** And so is ONE BBSCON, which is sponsored by *Boardwatch Magazine*, the definitive BBS source. Call or write for information about next year's show: *Boardwatch Magazine*, 8500 West Bowles Ave., Littleton, CO 80123; phone, 303-933-8880; fax, 303-973-3731.

The entire BBS scene will **grow at a fantastic rate** now that high-speed modems are dirt cheap. (FYI—there are now an estimated **50,000 BBS systems** in the USA.) A high-quality 14.4 Kbps modem is less than \$175. The next technology to **keep an eye on** is V.FAST. This is the new standard that will give you the ability to run at 28.8 Kbps. Folks, this is not 28.8 after some compression. This is 28.8 kilobits per second **raw data**. When you use V.42bis compression technology, the data rate jumps as high as a **whopping 115.2 Kbps!** This is screamingly fast. **Avoid** an interim quasi-standard called V.32terbo. This has a raw speed of 19.2 Kbps and is being pushed

The next modem technology to keep an eye on is V.FAST. Folks, this means 28.8 kilobits per second raw data. With V.42bis compression, the rate jumps to a whopping 115.2 Kbps!

by AT&T. Most observers say that V.32terbo will be **dumped** as soon as Rockwell releases the final V.FAST silicon this month or next.

Most modems have **standardized on the Rockwell modem chipsets**, and this will continue through V.FAST. The interesting aspect to the chips is the added features that not every modem maker is utilizing. The top of the line in the 14.4 chipset, for example, includes fax and caller ID capability. The new V.FAST modems will have fax, **caller ID, and voice mail!** All the circuitry needed for elaborate voice mail will be packed into every new modem. Figure about a minute of good-quality voice per megabyte.

I recall the days when the **know-it-all theorists** were telling us that the phone lines simply couldn't handle anything over 19.2 Kbps. I mentioned this to a Motorola engineer involved with their CODEX V.FAST modem who told me that the standards committee (the CCITT dreams up these schemes) is already working on something faster. "We've hit 56 Kbps on an unconditioned line!" I was told. Unfortunately, the connect rate is too low to be commercially acceptable. But obviously the trend toward increased modem speed is continuing.

Now, what were you saying about buying a 2,400-bps modem?

Info You Can Use Dept.: I'm a believer in MCI Mail as a reliable message service with gateways to Internet, CompuServe, Tandy, Microsoft, IBMMAIL, etc. It's very handy, and you can always get hold of people like me by using it. The company just announced a new toll-free fax number primarily for would-be subscribers located in the Northeast.

Dial 800-I-WANT-MCI (212-787-2416 for you outside the USA) and send them a fax with your name and billing address. An MCI Mail box costs \$35 plus a nominal fee per message sent. Messages received are free. Or you can sign up by telephone at 800-444-6245.

And Now the Bad News Dept.: Dell Computer's survey of Americans concluded that **too many people** are still **scared stiff** of computers (and technology in general). In fact, a lot of people are actually **intimidated** by the local bank's ATM machine, if you can believe that! I know I've never been able to teach my mother to hit the right buttons to tape a show for viewing. I gave up trying. According to this survey, 25 percent of those surveyed would not use a computer unless **forced** to. Is this pathetic or what? Do everyone a favor and introduce these people to computing. □

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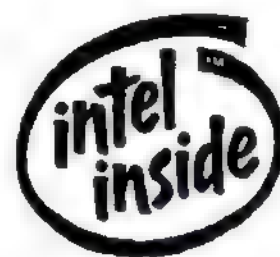


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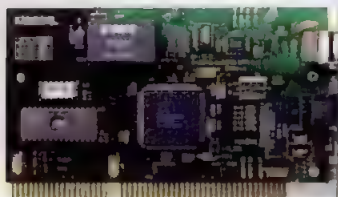
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Jim Seymour

Style and Focus in Software Suites

Which is more important to you: programs that work better together, or programs that help you work better with your co-workers? That's the choice you make these days when you buy a software suite.

Failure to understand that difference, and how it has arisen, can lead to an expensive and frustrating mistake in choosing the right suite for you, your co-workers, and others for whom you may be recommending or buying software.

The boom in the software suite business has been the biggest story, and the biggest change, in the PC applications software business over the past year and a half. Aggressive pricing by Microsoft and Lotus, the two dominant suite makers, has driven down the cost of the individual applications included in a typical suite package. At less than \$100 per app, the heavily discounted package-deal suite is still the way to go, even if you want only a couple of the five programs in Microsoft's Office Professional or Lotus's SmartSuite. (The economics of the shotgun-marriage bundle of Windows versions of Quattro Pro, Paradox, and WordPerfect—a very distant third in suite sales—aren't so clear, though that package can be a good buy, too.)

Buyers obviously agree: suites now constitute about half the applications sold by Microsoft, somewhat less at Lotus. Microsoft pocketed more than a billion dollars from Office over the past year.

The contest between the two companies in the suite business is rough, and has been one-sided, with Microsoft outselling Lotus about four to one. But the appearance of 1-2-3, Release 4, in SmartSuite this summer began to change that. The other applications in the bundles have been at rough parity for some time, but 1-2-3 for Windows lagged behind Excel. The new release of 1-2-3, however, brought SmartSuite into a close tie with Microsoft—so much that smart buyers began to look beyond

head-to-head evaluations of the individual applications in the two suites, toward broader issues of style and approach.

PROGRAMS VS. PEOPLE

And that's where buyers got into the question of which should work together better—programs or people.

That sounds like a loaded question. But don't think I'm being critical of packages that do more to get programs working together than to bring people together. In many cases, tighter program integration is more important to PC users than peer-to-peer work-sharing links to co-workers.

There are really three trends at work here, not just those two. Microsoft, Lotus, Borland, and WordPerfect Corp. are all also trying to improve their individual applications, as well as their suites' connections. Stand-alone sales of individual apps remain immensely profitable, and no company near the top of the PC business is about to slack off on improving its applications.

But it's increasingly easy to see that software suites are greater than the sum of their parts.

That is, the integration among the apps—the “glue,” so to speak—is a critical part of the value added by the suite. Bargain prices built the suite business, but the quality of the glue in suites is coming to be as important as the quality of the individual applications. And the directions taken by Lotus and Microsoft in creating and applying that glue are very different.

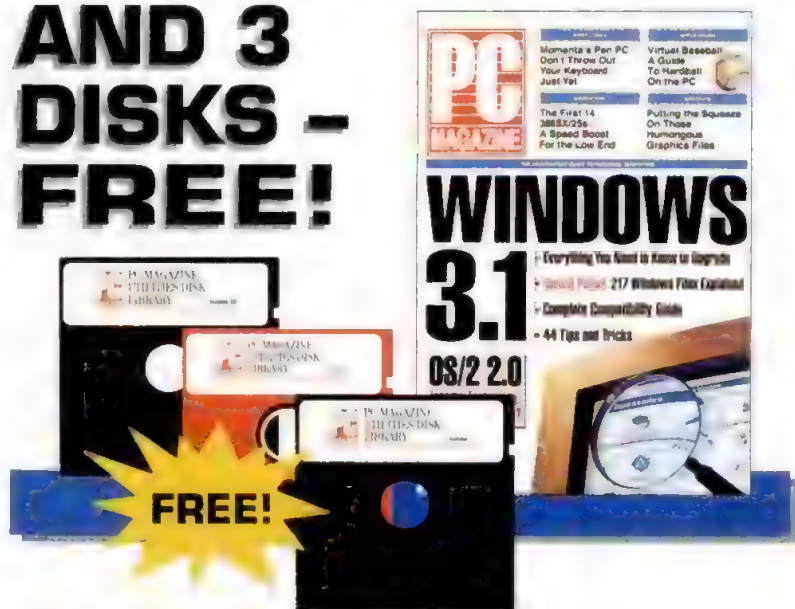
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Jim Seymour

mers' weekly round of golf in the hallways, to Bill Gates' intense sessions with developers, to the company's employee-incentive programs, focuses on turning out great code.

That focus delivers killer apps—and for software-suite glue, apps that work with other Microsoft applications in rich and surprising ways. The new Office Professional, Version 4.0, hints at that with a beefed-up Word for Windows; the free upgrades of Excel and PowerPoint, due before the end of the year, make even more clear Microsoft's commitment to programs that work well together.

Lotus, on the other hand, has been repositioning itself for the future using the communications links of Notes as its core product. By building Notes linkage into every SmartSuite application, Lotus is revving that package around the notion of programs that help *people* work together. For those workers who live in Notes—essentially a big, rich database—the links to the SmartSuite applications are dazzling. With this new suite, Lotus is finally delivering on its workgroup-computing promises on the application level.

The *leitmotif* of SmartSuite is now interpersonal communication, while the theme of Microsoft Office is interprocess communication.

CONVERGENCE AHEAD

Fortunately, these divergent paths will probably converge in a couple of years. Much of the interprogram linking and flexibility of the new Office apps comes from Object Linking and Embedding (OLE) 2.0.

A year ago, a Microsoft programmer working on the then-unreleased OLE 2.0 told me it would be a year before Microsoft's applications programmers understood it, and even longer before other companies did. He was right, but rich OLE 2.0 implementations will be appearing shortly from Lotus and others, too. We'll see lots of programs benefitting from that kind of connection. Similarly, Notes is becoming a kind of meta-glue for external applications, as Microsoft and others develop links to the Notes API.

Today, you still have to choose between programs that work better together and programs that help people work better together. In another year or two, that distinction may have disappeared. □

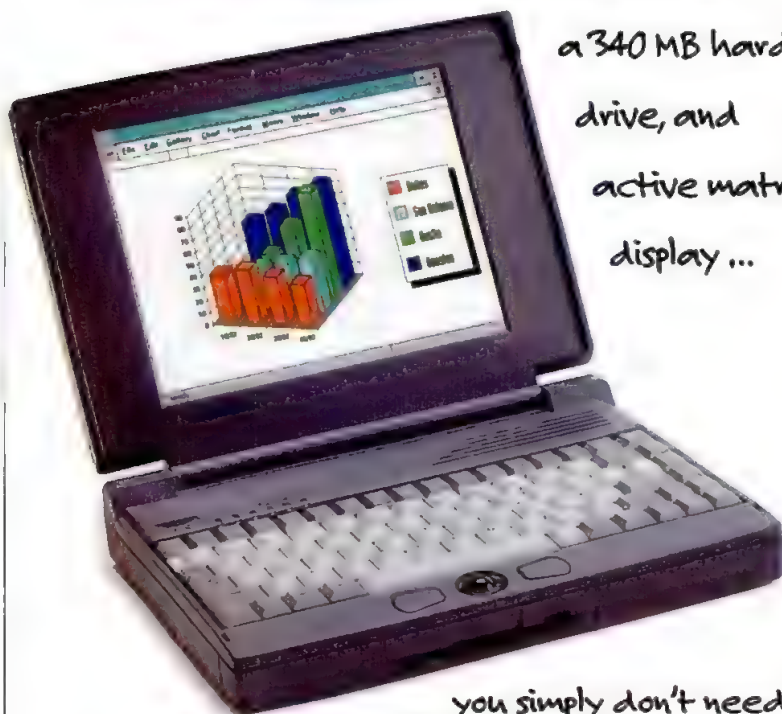


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Bill Howard

A Few Less Sheets to the Wind

We spent the '80s trying to generate more data. We're destined to spend the '90s coping with ways to digest all the data we produce. For the data you print and pass around, nothing beats putting your information on a really big sheet of paper.

And you're likely to print out your most important information because, as we all know, the paperless office is a great idea that's a long way off.

One of the most effective productivity tools your company can own is a tabloid-size printer. These are the printers that handle 11- by 17-inch, or B-size, paper. How big is a B-size printout? You can easily fit two years of monthly spreadsheet sales projections across the wide dimension. Reduce the cell widths and you can display ten years of quarterly information. If your data spills to multiple pages, you face only at half as much aligning and taping.

There are other compelling applications for a B-size printer, besides spreadsheets and CAD drawings:

Group annotation. Print your 8.5- by 11-inch document centered on an 11-by-17 sheet and you have room for extensive comments by a half-dozen people.

D.I.Y. brochures. Large format, duplex printing will allow you to print small quantities of a four-page flier without going to a print shop. Print pages 4 and 1 on one side, 2 and 3 on the other, and then fold it down the middle.

High-res masters. If you're planning to send an A-size (8.5- by 11-inch) document to a commercial print shop, print each master at 200 percent of the final size on your printer, then have the shop photo-reduce to half-size. Presto! Instant 600-dpi output from a 300-dpi printer. The output quality may be good enough for you to scan and print your own photo halftones rather than have them stripped in separately.

Novelties. You'll also find that the tabloid-size printer is popular for making big "Happy Birthday" signs.

BIGGER AND PRICIER?

The price of B-size lasers using Canon and Fuji/Xerox engines can be as little as \$2,500, although most are \$3,000 to \$5,000. They're available from Apple, Compaq, Dataproducts, Genicom, NewGen, QMS, and Xante. Some have resolutions up to 600 dpi. Typically, you'll want to hook that much printer to a network.

You also can get B-size printers for less than \$500. For several months now, I've worked with the Canon BubbleJet BJ-230 ink jet printer and I've been continually impressed by the speed and quality of the output. (A review of the BJ-230 appears in our next, printer issue.) Office buying politics being what they are, you may find that you can easily get several of these individually approved with little trouble.

If the Canon unit isn't capacious enough, there's even a C-size, 17- by 22-inch ink jet printer, the Pacific Data Products Pro-Tracer II (619-552-0880), which sells for about \$1,500. That's four letter sheets of data on a single big sheet.

One other printer-related recommendation: If you need to print labels yet find it incredibly frustrating to

merge data and align the output, look into the new LabelPro for Windows software from Avery-Dennison (909-869-7711, \$129.95). It effortlessly prints mailing labels, nametags, shipping labels (with bar codes if you like), and even batches of business cards. There are quite a few rough edges in Version 1.0, but LabelPro stands head and shoulders above Avery's aging DOS product of the same name. Printing labels and mailing lists isn't sexy, but it's an important part of office productivity—at least until the advent of the paperless office. □



Tabloid-size printers mean more information, greater possibilities, and less Scotch tape.

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Canon

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A vibrant collage of various objects including a tiger, a car, a football, a lightbulb, a clock, a butterfly, a fish, a flower, a sunflower, a diamond, a hammer, a crocodile, a four-leaf clover, a lobster, a clock, a butterfly, a musical note, a globe, and a person jumping, all surrounding a central black oval containing the text "The BJC-600 In Color." The collage is composed of numerous small, colorful illustrations of everyday and natural objects, creating a sense of a wide range of subjects that can be captured in color. The objects are scattered around the central text, with some appearing to be part of a larger scene or a collection of items. The overall effect is one of a rich, detailed, and colorful world that is being presented in a single, unified image.

WORD PROCESSORS

Documents Take the Center

Word processors, once isolated programs that needed to know little more than how to talk to a printer or two, are rapidly becoming the hubs of complex integrated software systems.

by Edward Mendelson

Suddenly, no word processor is an island. Word processors have always been the central focus for most users; they are about to become even more central in a new era of mutual cooperation and integration among applications. Programs that once let you do little more than type and format unadorned text now serve as automated clearinghouses for spreadsheets, graphics, and databases, as well as workgroup comments and revisions. Even if you still use a word processor to work only with words, you'll find that the same technical prowess that now lets programs integrate

disparate kinds of data into a single document can also automate and simplify the traditional tasks of writing and editing.

Although DOS-based word processing continues to thrive, notably in the spectacular WordPerfect 6.0 for DOS, most significant advances now occur in

Windows- and OS/2-based products. For example, all major Windows-based word processors now use OLE (Object Linking and Embedding) technology. This lets a document seamlessly incorporate "objects" created by spreadsheets, graphics packages, and sound or video recorders—even other word processors. Whereas word processors of

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Stage



the past often included primitive table or line-drawing functions, new versions of the same programs can use OLE to access *all* the functions of a full-featured spreadsheet, drawing, or graphics package.

When OLE 2.0 arrives—first in Word 6.0—your editing screen won't be limited to the tools available in your starting application. A double-click on an object will replace the current menus with menus of the appropriate application. So, for example, a double-click on a table in Word 6.0 will invoke all of the tools for table creation in the forthcoming Excel 5.0. Ami Pro already provides a similar integrated interface using its built-in drawing, charting, and table modules. OLE 2.0 extends this concept so that every application that supports the OLE standard can be used in an integrated environment.

Even if you don't use OLE or SOM functions, frustrations diminish when all the programs you use share a similar interface and command logic. So, you can buy Lotus's Ami Pro and Microsoft Word for Windows as standalone packages, but an increasing number of corporations now buy them as part of multiprogram packages that also include spreadsheets, presentation graphics, and other applications. The current versions of the programs that make up Lotus SmartSuite and Microsoft Office haven't yet achieved seamless integration, but they already share many tools.

WordPerfect Corp., offering a smaller range of applications than Lotus or Microsoft, approaches integration differently. Instead of linking the word processor to an external spreadsheet, Versions 6.0 of WordPerfect for DOS and WordPerfect for Windows expand the table feature of earlier versions into a built-in spreadsheet with advanced mathematical and financial functions. WordPerfect also integrates smoothly into the WordPerfect Office e-mail and scheduling package, and you can buy WordPerfect for Windows in a bundle called Borland Office for Windows, which includes Paradox and Quattro Pro.

Lotus, Microsoft, and WordPerfect all

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EDITORS' CHOICE

- *For documents with lots of graphics.....***Ami Pro**
- *For general text editing.....***Microsoft Word for Windows**
- *For DOS users and those with heavy file-tracking needs.....***WordPerfect for DOS**
- *For those needing a native OS/2 application.....***WordPerfect for OS/2**

The word processing world is shrinking. Once a wide-open arena with dozens of competitors, it is increasingly being overtaken by Lotus Development Corp., Microsoft Corp., and WordPerfect Corp., which are slugging it out for dominance of the general-purpose word

processing market. It is not surprising, therefore, that products from all three of these vendors are Editors' Choice recipients. Each package is a mature, well-rounded product, and each has at least one special strength.

Last time we reviewed graphical word processing software (February 25, 1992), Lotus's Ami Pro, Version 2.0, shared Editors' Choice honors with Microsoft Word 2.0 for Windows, primarily on the strength of its graphics-handling abilities. Its current descendent, Version 3.01, retains both Editors' Choice status and distinction as the program of choice for shops that need

to produce graphics-heavy documents. While somewhat short of perfect, Ami Pro's use of frames for placing and manipulating graphics elements (similar to that of many desktop publishers) outperforms anything the competition has to offer. Ami Pro is also among the most fleet-footed of the graphical word processors, and its applications-development language is second to none.

Kudos for general text-processing power goes to Microsoft Word 2.0c for Windows, the last in a series of maintenance upgrades to Version 2.0, which shared Editors' Choice honors with

plan to introduce common macro languages for their product lines. Combined with OLE, a common language will eventually make it easy to automate complex tasks like data gathering and formatting, which now require tedious manual labor.

USABILITY WARS

In today's mass market, usability is as crucial as integration. Lotus, Microsoft, and WordPerfect spend millions on usability labs where users attempt basic tasks while their stumbling keystrokes and detours to the help system are recorded for analysis. The worst stumbles lead to the most radical interface redesign. Microsoft, for

example, found that few users could navigate the vertical columns in icons that led to some submenus in Word for Windows 2.0. Version 6.0 replaces them with a clear array of index-card-style tabs.

The labs still haven't smoothed away all the rough spots, unfortunately. Ami Pro, despite its generally exceptional ease of use, displays some incomprehensible dialog boxes with no access to on-line help. You can waste hours before discovering that Word for Windows 6.0 makes you switch out of page-layout mode before you can modify some page layout features.

FEATURE EDGE

Networks and ever-larger hard disks make vast quantities of information accessible to users, but as the amount of information increases, ease of recovery decreases. All major word processors include search engines that scan disks for data, but a pre-

Ami Pro in our February 1992 roundup. WinWord is still the best-balanced word processing product on the market and, as verified by our new, explicit ease-of-use evaluation, the easiest to use. Its implementation of the template concept still has no peer, and the program's use of styles remains the most powerful and flexible in the marketplace. WinWord's applications-development language, WordBasic, shares the winner's circle with Ami Pro's language, and the program's abundance of keyboard shortcuts makes it an especially excellent choice for folks who hate reaching for the mouse.

WordPerfect has rewarded its customers' patience with a superb new DOS product, Version 6.0. It is astoundingly rich in features and brings much of the convenience of a mouse-driven graphical interface to the character-based world of DOS. Version 6.0's fully editable, WYSIWYG graphical mode is a technological wonder (though you may wonder why anyone with the hardware muscle to run it efficiently hasn't moved to Windows). Version 6.0 perpetuates many of WordPerfect's traditional advantages, such as strong font and printer support, a first-rate text-indexing facility (for quickly locating documents), and the biggest

and most easily accessed symbol set in the business.

While WordPerfect 5.2 for Windows doesn't shine quite brightly enough to eclipse its Windows rivals, its OS/2 sibling clearly outclasses the competition on that platform. WordPerfect 5.2 for OS/2 integrates with the Workplace Shell more fully and successfully than any other native OS/2 word processing application to date. Also, it serves as a model for the future of object-oriented application software: When you install the package, files on your disk from any recent DOS or Windows version of WordPerfect are automatically registered as WordPerfect document objects, complete with special help screens and a display of information from the internal document summary.

Having enumerated the choicest word processors of 1993, we hasten to point out that by early next year, the word processing scene will have changed substantially. New Windows packages from Lotus, Microsoft, The Technology Group, and WordPerfect, as well as a native OS/2 version of Ami Pro, are scheduled to be released soon, which will make this a whole new ball game.

built index of the data in your files can locate items many times faster than a brute-force disk scan.

Separate indexing packages like ZyIndex are fast and powerful but aren't integrated with the programs in which you create and modify text. Nota Bene, the specialized text-only word processor from The Technology Group, has for years offered a built-in "textbase" for instant access to files, but the same idea only entered mainstream word processing when WordPerfect introduced its QuickFinder indexer in Versions 5.2 of WordPerfect for OS/2 and WordPerfect for Windows, and Version 6.0 of WordPerfect for DOS. If you need to search for data across a half-dozen network drives, an indexer like WordPerfect's is indispensable. To speed access within and between files, WordPerfect now let you build hypertext links entirely from menus, without macro programming.

While WordPerfect worked to speed access to text, Microsoft and Lotus pioneered advances in entering text and formatting it. Microsoft Word for Windows introduced document templates—features now also found in Ami Pro and WordPerfect for Windows. Templates have their own menus, security features, screen displays, and macros that prompt a user to enter text in a series of fields. With Ami Pro, Lotus pioneered format menus that preview the results on the page—a feature now also used in WinWord and WordPerfect. With the DOS version of Microsoft Word, Microsoft pioneered stylesheets for consistent formatting of complex documents, but few users of Microsoft Word for DOS or WinWord ever bothered with them. Now, WinWord 6.0 introduces *automated* stylesheets, which use intelligent algorithms to identify headlines and text and apply appropriate formatting effortlessly.

Hidden behind the more visually impressive features of recent releases are enhanced features like outlining and indexing. Advanced merge functions that once required tedious programming and error-prone manual entry of merge fields can now be performed from menus that guide you through every step.

SORTING THEM OUT

The three market-leading Windows word processors increasingly resemble each other in functions and interfaces, and, in its graphics mode, WordPerfect 6.0 for DOS looks remarkably like a Windows program. But each package retains a different emphasis and a different set of strengths. WordPerfect for Windows offers the greatest power and flexibility in working with raw text, although its spreadsheet functions and Windows-based graphics functions now equal or surpass those of its rivals. Where other Windows word processors support only Windows' set of 228 symbols, WordPerfect for Windows supports 1,500 foreign, technical, and iconic characters and ensures that they all will print from any computer with a copy of WordPerfect.

WinWord, especially Version 6.0, offers the richest automation features and probably the greatest ease of use. In addition to automating its stylesheets, it corrects typing errors and expands abbreviations as you type (a feature initiated in XyWrite III). Also, its "wizards" automatically create complex formats on request. Ami Pro (with Version 4.0 still waiting in the wings) integrates graphics most thoroughly, resembling a desktop-publishing package with its extensive use of frames. Unlike Microsoft Word and WordPerfect packages, Ami Pro has drawing, charting, and image-enhancement functions that are so tightly integrated they don't use separate OLE-enabled modules; they are built into the word processor itself.

You don't have to choose among the best-selling DOS and Windows packages for powerful word processing, however. XyWrite 4.0 offers dazzling text-mode speed and raw programmability, as well as full compatibility with a new Windows version (which didn't ship in time for this roundup). The DOS-based Textra, Version 7.0—which also narrowly missed our testing dates—provides compact, effective, and economical control over

H I G H L I G H T S

Word Processors

THE WORD PROCESSING market-place has blossomed, burgeoned, and now matured—to the point where it appears to be shrinking. Some old, established products—WordStar comes to mind—are disappearing from the roster of active, ongoing players. The good news is that the quality of the players who remain in the game is higher than ever.

“AUTO-EVERYTHING” seems to be the watchword of the season, with automated features in this season’s crop of packages running the gamut from real-time spell-checking in XyWrite 4.0, to merges Ami Pro style, to envelope printing in the Microsoft Word for Windows manner. Look for this intelligence/automation trend to accelerate sharply in the future. Programs you’ll see next year will stun you with such features as intelligent, automatic formatting—of entire documents.

DOS GOES GRAPHICAL with WordPerfect 6.0 for DOS, quite possibly the best DOS application ever written. This technological wonder comes complete with full WYSIWYG graphical editing and a fully mouse-driven windowing interface. The trade-off is that this is an extremely slow pup in graphics mode. If you need to manage many megabytes of data, WordPerfect’s superfast file indexer and list of descriptively named directories still have no equal anywhere on the market.

THE ARCHETYPAL command-line word processor beloved by writers and editors has arisen Phoenix-like from the ashes of apparent oblivion in the form of XyWrite 4.0. The Technology Group acquired original developer Xyquest in fall 1992 and plans a long future for the venerable product. Version 4.0 fills some of the more obvious gaps in XyWrite’s

feature set, offering a graphical view mode (editable) and an optional menu-driven interface. And are you ready for XyWrite for Windows? It’s on its way.

OS/2 ARRIVES. OS/2 has been around for a long time but, frankly, until WordPerfect 5.2 for OS/2, we hadn’t seen a native word processing application we could really love. This program integrates its considerable strengths into OS/2’s Workplace Shell in a way that sets a standard for others to follow. DeScribe Word Processor for OS/2, Version 4.0, also has impressive features, but it can’t match WordPerfect in depth and range.

DEVELOPING APPLICATIONS is getting to be an everyday chore for word processors. Just about all the packages we reviewed had at least some macro capability. XyWrite 4.0 carries on the tradition of being totally customizable. The big leaguers, Ami Pro, Microsoft Word for Windows, and WordPerfect, have heavy-duty languages capable of building industrial-strength applications. These languages, or their successors, will soon work seamlessly across whole suites of applications.

DDE AND OLE, once little more than buzzwords relating vaguely to the future of PC-based software, are rapidly becoming features to reckon with. In testing for this story, we put programs through their connectivity paces, exploring data linking and object embedding in a variety of contexts. The findings? This stuff actually works! A year from now, we’ll think nothing of editing spreadsheet-based charts in our word processing documents or automatically pulling updated information from our corporate databases for weekly status reports.

text. And Q&A Write, Version 3.0 for Windows, is an efficient, affordable Windows package. Among OS/2 packages, WordPerfect 5.2 for OS/2 offers a glimpse of the document-centered future with its deep integration with the Workplace Shell. And DeScribe Word Processor for OS/2, Version 4.0, lets you undo every keystroke you performed during an entire session. Whatever word processing tasks you face in the months ahead, one or more of these programs can get the job done quickly and efficiently.

Here we explore the state of word processing for the first time since sales of Windows software decisively outpaced sales of DOS products. Our reviews cover all available programs that have received a substantial upgrade since our last surveys (of graphical programs, February 25, 1992; of DOS programs, May 26, 1992) and that include the features essential to full-featured document processing in today’s market: support for scalable fonts and imported graphics, extended character sets, multiple-document editing, graphics preview or editing mode, and spreadsheet import or built-in tables. Two new programs that include all these features—WinWord 6.0 and WordPerfect for Windows 6.0—were still in beta testing as we went to press, so they are previewed here. They represent the true beginning of a document-centric universe, and we’ll be looking at them more fully in upcoming issues.

Lotus Development Corp.

Ami Pro

BY JANICE STEVENSON

Ami Pro, Version 3.01, provides a flexible and usable environment for creating elaborately formatted and highly graphic-oriented documents. In many ways it spans the boundaries between traditional word processing and desktop publishing systems. Ami Pro’s modus operandi relies heavily on stylesheets and frames. With a robust set of built-in drawing, table, and equation tools, and DTP-like features such as shaded and overlapping frames, Lotus’s \$495 package handles the majority of complex tasks with aplomb. Ami Pro’s basic metaphors are generally consistent, and you’ll only rarely be surprised to find that



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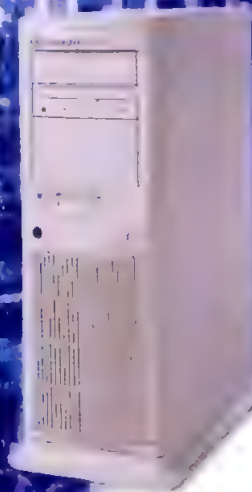
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Software Choices

- If a system comes with "choice of application software," choose one of the following packages:
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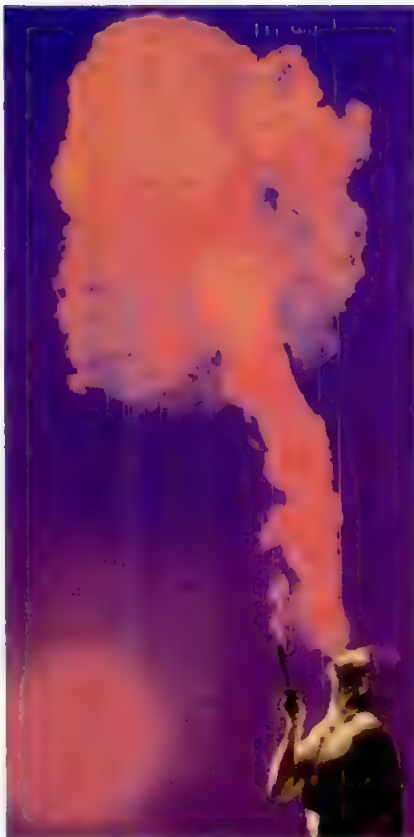
\$105 Twisted Pair or BNC Kit (BNC Kit includes cable, connector, terminator and card)

■ Gateway 2000 Ethernet Adapter

This third-generation adapter manufactured by 3Com features parallel tasking architecture which speeds up packet processing and improves adapter performance. Plus, its high level of integration greatly reduces the number of discrete components, lowering cost and increasing reliability.

\$105 Twisted Pair

\$125 BNC Kit (includes cable, connector, terminator and card)



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KX-P2123 **\$259**

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The software and peripherals listed here are sold only with the purchase of a system. For details on our complete line of extras for Gateway customers, ask for our special add-on components division when you call.

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Details about our warranty, guarantee and on-site service program are available upon request.



Tools on Top™ is now included on all Gateway 2000 mini desktop, desktop and tower systems. Program includes file manager, desktop and emergency disk portions of Central Point's award-winning PC Tools for Windows.



Suitability to Task

With this roundup, *PC Magazine* introduces a new format for software Suitability to Task evaluations. Whereas in the past we gave you a single rating for each major task category, here and in the future we will provide two ratings per task: one for feature depth, one for ease of use. This new dual rating system should lend depth to our analysis and provide a much rounder picture of the products we review, which may ultimately help facilitate your purchasing decision.

Because our old ratings combined these evaluations into a single score, two products could achieve the same rating for quite different reasons. For example, a product extremely rich in features but difficult to use and another with reduced functionality but satisfactory performance might both have received good ratings.

Under our new procedure, we rated depth and ease of use for each of the numerous specific-function subcategories within our four basic task categories. Next, we weighed each subcategory rating and reviewer rating, calculating a base rating from the weighted scores. Finally, we discussed base ratings to ensure that the final ratings were consistent with everyone's impressions of the products and revised where appropriate.

Though today's word processors are enhanced by

SUITABILITY TO TASK		
Product	POWER	EASE
Letter	Poor	Excellent
Business report	Fair	Good
Newsletter	Good	Fair
Long technical document	Excellent	Poor

many new and wonderful features that help them create increasingly more complex documents, the most common task for these programs is still the creation of **letters**, memos, and other short documents. We first created a single-page letter, setting margins, tab stops, and horizontal and vertical alignment. We then extended the letter to a second page and added headers and settings for multiple paper types.

We then looked at templates and stylesheets, which help users produce attractive documents quickly and easily. We also tested basic macro functionality and data integrity. Finally, we tested mail-merge and label and envelope printing.

Word processors can also significantly ease the creation of **business reports**. We laid out the framework for our report using each program's outline feature. We tested automatic numbering as sections were inserted, moved, and deleted. We also looked at the programs' use of styles, which help improve the consistency of a document. Additionally, our report contained tables with some

math, bulleted and numbered lists, and embedded and linked spreadsheets and graphics. In addition, we evaluated the programs' group-editing capabilities, checking to see that the integrity of each document was maintained as it was passed among users.

Today's sophisticated word processors rival the capabilities of many low-end (and even some high-end) desktop publishing programs. Our **newsletter** document included snaking columns, headers and footers, page-numbering modifications, special characters, hyphenation, and drop capitals. In producing our newsletter, we also had to work with text and graphics elements in frames, controlling text formatting, frame placement, and borders and shading.

Our last task was to create a **long technical document**, a term that might apply to a book, manual, or long report. We created a master document using references to external subdocuments (when such a feature was available), rather than actually pasting the subdocuments into the master. Programs needed to be able to create a numbering scheme that indicated the chapter and number of each page (1-1, 1-2, 1-3, and so on). Other elements included in our long document were a table of contents, an index, footnotes, endnotes, and equations. We looked at the packages' use of stylesheets, which help ensure consistency across all of the elements in a document, and file-management techniques, which help find and organize the pieces of the master document.

simple tasks require nonintuitive actions.

Long before OLE 2.0 was a gleam in Microsoft's eye, Ami Pro offered in-place editing of graphics, charts, and tables. When you double-click on a table, the editing screen doesn't change, but the top-line menu and SmartIcon palette offers table tools instead of the standard text-editing tools. Ami Pro's built-in modules let you modify a chart or draw a freehand graphic while the chart or graphic remains visible on the page—not in the separate window that opens when you use Windows' Dynamic Data Exchange (DDE) or OLE 1.0 standard to work with charts or graphics from other applications. Ami Pro fully supports DDE and OLE 1.0, but its in-place editing modules generally make it unnecessary to use them. The charting module lets you create highly customized bars and graphs; the drawing module includes a rich

set of freehand tools; and the equation module is intuitive and graphic. A special image-modification module for imported gray-scale TIFF files lets you modify brightness, contrast, and smoothness—features normally available only in DTP packages.

Ami Pro's 54 predefined (but modifiable) stylesheets provide layouts for many types of documents. Stylesheets include a mixture of formatting information, graphics elements, and fill-in-the-blank areas. For example, Ami Pro's memo stylesheet displays a dialog box to prompt you for sender, recipient, and subject information, then neatly places that data in the appropriate spots in the memo.

Ami Pro lets you handle most text formatting through named paragraph styles. You can maintain a consistent look in your documents, but it can be hard to modify individual paragraphs. You can apply a cus-

tom font or indents to any paragraph without altering the stylesheet, but if you want to adjust the space before or after a single paragraph, you have to create a new style. With complex documents, this can lead to a confusing proliferation of styles. On the other hand, Ami Pro's Fast Format feature lets you "paint" either the paragraph formatting or text formatting onto any other existing text with the click of an icon.

FRAMED

Another cornerstone of Ami Pro is the frame, a document within a document that facilitates object placement and multiple layouts per page. Ami Pro's approach to frames is an improvement over that of WinWord. Text typed within a frame uses the parent document's styles by default (WinWord needs special frame styles). You can group multi-

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Version 3.1

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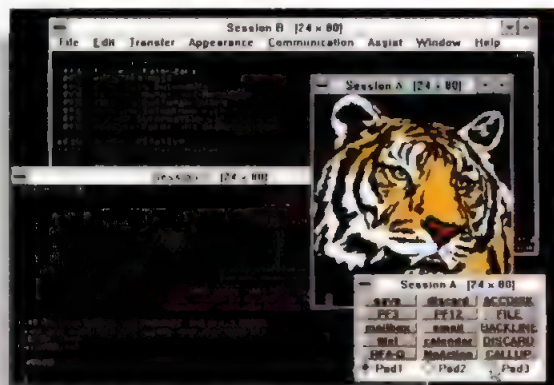
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SUITABILITY TO TASK		
Ami Pro		
	POWER	EASE
Letter	Excellent	Excellent
Business report	Excellent	Excellent
Newsletter	Excellent	Good
Long technical document	Good	Good

ple text frames and move them easily from page to page while maintaining their relationship; this isn't possible in WinWord. Pictures always reside in frames in Ami Pro but cannot be combined with text (which isn't the case with WinWord). Nor can picture frames be grouped, which means, for example, that your company logo (a picture) in one frame cannot be automatically manipulated together with your company name (text) in another. Also, when you import a graphic without first defining its frame, Ami Pro uses the frame size from the last framed object, possibly as small as a single character.

Because of Ami's emphasis on styles and frames, long intricate documents are generally easy to create. The master document feature, designed to create multi-chapter publications from separate files, is more trouble than help, however.

FACT FILE

Ami Pro, Version 3.01
 Lotus Development Corp., Word Processing Division, 55 Cambridge Pkwy., Cambridge, MA 02142; 800-831-9679, 404-698-7660; fax, 404-698-7660

List price: \$495
Requires: 1MB RAM, 10MB hard disk space, Microsoft Windows 3.0 or later
In short: Ami Pro 3.01 presents a strong challenge to Microsoft Word for Windows through the implementation of a powerful frame feature, comprehensive table capabilities, and a concise merge process. The styles feature, though very powerful, could lead to a rat's nest of styles on sophisticated documents. In some instances, Ami Pro goes the extra step necessary to achieve number one status, but in others, its implementation could use refinement

ON READER SERVICE CARD

OUTLINES & TABLES

Ami Pro's collapsible outlining includes an option that helps you organize your work by displaying different fonts in outline view from the fonts displayed in normal views. This lets high-level paragraphs stand out in large or bold type while you work in outline mode; the same text appears in a normal font when you print the document. The feature is confusing when you first configure it, but powerful and effective afterwards.

Ami Pro's tables offer a couple of features not found in Version 2.0c of WinWord. First, Ami Pro can vertically connect cells. But Ami Pro stretches the first cell to cover the area of the additional cells selected, hiding any data they might contain (WordPerfect 6.0 for DOS truly merges the contents of joined cells). You must manually disconnect the cells and move the hidden text to the first cell to keep it visible. Second, table cells may span page breaks. But the user must specifically define the table layout to include this feature, ensuring that cells do not break accidentally.

Cell formatting of Ami Pro tables is not extensive. In testing, we were unable to center text vertically within a cell automatically. We also found no facility for converting text to a table or vice versa. This was especially vexing when we tried to view ASCII-delimited merge data.

Speaking of merging, this is one of the smoothest features in the product. Ami Pro handles the process from start to finish using dialog boxes. The interface with external data files is terrific; Ami Pro can call on data from a host of applications. It also contains a spiffy data-entry interface for creating its own data file; it mimics a Rolodex card. Fields that you define appear as entry blanks on the card. They are easily added or renamed. They cannot, however, be easily removed.

Other Windows word processors make you wait while they format a document for printing, but Ami Pro has a background printing module that lets you get back to work immediately after you enter the print command. Also, Ami Pro has four levels of undo.

Creating predefined labels in Ami Pro is

The Rolodex-style dialog box makes adding new records to an Ami Pro data file a joy.

a breeze. Layouts for many stock Avery labels are included as stylesheets. Custom label creation is a little trickier because of the number of steps. As is, it still beats WinWord's manual label creation.

In its quest to unseat Number One, Ami Pro sometimes succeeds. It generally performs faster than the Windows-based competition and experiences few difficulties establishing DDE and OLE links. If you regularly use other Lotus products, Ami Pro is the clear choice, as it is designed to share resources and a common interface design with Freelance Graphics for Windows and Lotus 1-2-3. But if you are sold on Microsoft Excel, WinWord 2.0c might be the better bet.

DeScribe Inc.

DeScribe Word Processor For OS/2

BY EDWARD MENDELSON

DeScribe was the first word processor written for OS/2, and it remains the only one designed from the start to take advantage of IBM's advanced GUI operating system. Version 4.0 of DeScribe Word Processor for OS/2 (\$495) includes technologically spectacular features that no other program can match, but it has awkward tendencies its rivals have long since outgrown.

DeScribe lets you combine multiple documents by dropping document icons from the OS/2 desktop on top of the icons on DeScribe's customizable toolbar. You can also combine documents through a simple

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master document feature. DeScribe's unlimited Undo capability lets you play back an entire editing session in reverse, so you can recover text you deleted an hour ago. The WYSIWYG editing screen can display thumbnail views of multiple pages and a zoomed-in view of the same file in different windows, letting you edit both windows at the same time. The thesaurus offers antonyms as well as synonyms.

But the menu structure often seems needlessly complex, and the program lacks automated conveniences found in other packages. If you need a native OS/2 word processor, however, DeScribe offers raw strengths that you can harness through its macro language and its customizable keyboard.

DEFINING POWER

DeScribe's unique editing features include a search-and-replace menu that can replace two strings at the same time. State-of-the-art indexing includes the option to ignore the first character in strings like *.BAK* when alphabetizing the index. Surprisingly, the package supports endnotes but not footnotes, unless you manually number notes and insert them in frames at the foot of the page—a laborious process.

Hierarchical stylesheets, organized on a tree-like display, let you keep track of complex formatting. The unique Style Status menu tells you the state of every possible format option applied to the text at the cur-

sor location. But DeScribe can be unintuitive: Modifying and applying formats and styles often requires a complicated journey through submenus labeled "Other" to find the option you need, and the deeper submenus often lack keyboard shortcuts that could make the trip faster.

In ordinary business writing, DeScribe makes you do much of the work that other programs do for you. If you want to delete a word with a single keystroke, you have to

write or record a macro and assign it to a key. You can attach envelopes to merge files, but if you simply want to print an envelope when writing a letter, you have to select the envelope layout and insert the address by hand. You

can, however, automate this by writing a macro. Unlike Microsoft Word or WordPerfect packages, DeScribe doesn't include a keystroke that toggles into select mode, so you can't use the Search menu or other menus (such as Go To) to extend a selection of a block of text.

Some menus are inconsistent. For example, you can select a snap-to-grid option for the tab and margin settings on the ruler at the top of the editing window, but the same option doesn't apply to the ruler in the tab menu. DeScribe beeps if you hit an inappropriate key, and you can't disable this feature. Thorough manuals and help screens make up somewhat for the unintuitive interface.

FRAMES AND SUCH

DeScribe uses frames as the basis for all page formatting and for features like nonprinting notes. Frames can be moved or resized with the mouse, but you have to use a Frame Manager menu to delete them. Graphics import filters, licensed from Inset Systems, handle some TIFF (Tagged Image File Format) files that other programs reject, and the program's built-in drawing tools let you create straight lines or arcs, but not Bezier curves. Frames can include both graphics and text.

FACT FILE

DeScribe Word Processor for OS/2, Version 4.0

DeScribe Inc., 4234 North Freeway Blvd.,
#500, Sacramento, CA 95834; 800-448-1586,
916-646-1111; fax, 916-646-1111



List price: \$495 LAN version 10-pack, \$1,995; LAN version 20-pack, \$2,995

Requires: OS/2 2.0 or later, 6MB RAM, 4MB-11MB free disk space

In short: DeScribe Word

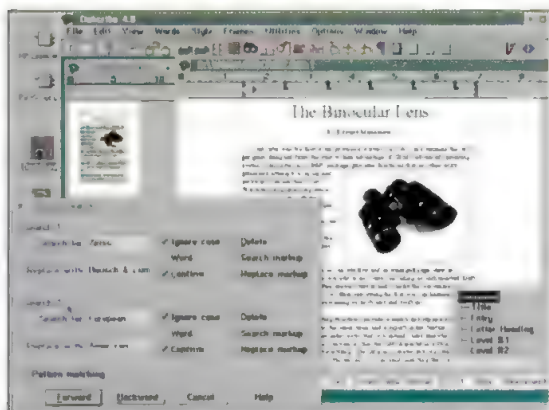
Processor for OS/2, the first word processor written for OS/2, has an unlimited Undo capability, advanced hierarchical styles and indexing, and a customizable interface closely integrated into OS/2's desktop. But its awkward menus and lack of automatic footnoting, envelope printing, and built-in math make it vulnerable to rivals like the OS/2 versions of Ami Pro and WordPerfect.

402 ON READER-SERVICE CARD

Tables don't support arithmetic functions, but you can link spreadsheets from other applications via DDE (Dynamic Data Exchange).

The normal editing screen wastes space by displaying the top and bottom margins of the page, but you can switch to a minimally formatted draft display, which is also used for an effective outlining mode. The degree to which the printed page resembles what you see on the screen depends on the printer driver. With the OS/2 PostScript driver, the screen matches the page, but with the OS/2 LaserJet driver, word spacing on-screen is wildly erratic (although the correct spacing appears on the printed page). Other OS/2 packages don't have this problem.

DeScribe's current version is more stable than earlier ones, but it still occasionally shuts down abruptly. The program displays a warning message, then closes instantly—although it offers you the chance to recover the most recent of its frequent "snapshots" of your work when you start up again. Despite the 32-bit architecture, many of DeScribe's functions are slower than those in 16-bit Windows programs. It faces strong rivalry from OS/2 versions of WordPerfect and Ami Pro, but its unique and imaginative features make it worth serious consideration as the word processor of choice for an all-OS/2 environment.



DeScribe Word Processor for OS/2's search menu lets you search and replace two strings at once.

Mission



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Optimization	Global
	Inter-module
	Function inlining
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starts here.



Microsoft Corp.

Microsoft Word for DOS

BY EDWARD MENDELSON

With each new version, Microsoft Word for DOS looks and works more like Microsoft Word for Windows. Version 6.0 of this \$495 text-mode program lags behind WinWord 6.0, although they share

the same version number; it does, however, share many of the notable features of WinWord 2.0. Both are oriented more to text than graphics, and both use powerful and easily managed stylesheets for formatting—although their stylesheet formats are significantly different. Both let you open windows on two or more different parts of a document at the same time and edit them simultaneously—a convenience offered by no other major DOS or

Windows package. But where the Windows version is a complex powerhouse that needs fast hardware, the DOS version remains essentially a small-scale program that can run on an ancient PC/XT with monochrome video.

Word for DOS uses WYSIWYG fonts and graphics only for uneditable print preview, unlike WordPerfect for DOS, which features a fully graphical editing screen. But Word for DOS's editing

▪ Dream Machine

What if you could design a no-compromise word processor that does everything?

by Edward Mendelson

In a few years, if Microsoft Corp. and IBM Corp. have their way, you'll work with documents, not applications, and you'll scarcely notice that different programs with different strengths come into play on a single page to edit text, calculate a table, or manipulate graphics. What if you could extend this object-oriented metaphor and combine features from different word processors to make up your own ideal word processor? What if you could combine the file indexer from WordPerfect, the automated stylesheet feature from Microsoft Word for Windows, the customizable outliner from Ami Pro, and the unlimited Undo feature of DeScribe? What would your word processor be like?

It would probably start by making text entry fast and effortless. It would include the correct-as-you-type feature from Nota Bene, WinWord 6.0, and XyWrite 4.0. It would allow one-key-stroke transposition of letters, words, sentences, and paragraphs, as in Nota Bene and XyWrite. It would let you work without graphics overhead in a true character-mode screen, like Nota Bene, WordPerfect for DOS, and XyWrite. (If users insisted, Windows word processors could have an option to switch into true character mode instead of draft mode.) And for non-nonsense power users, it would include XyWrite's command line.

SYMBOLS A-GO-GO

Like WordPerfect and Nota Bene, the ideal program would support thousands of foreign and technical symbols and give you mnemonic keystrokes for entering them. It would let you edit different parts of the same file at the same time—a feat you can now perform in DeScribe, Microsoft Word, and Textura. Like Microsoft Word, it would display footnotes and the main text on the same screen. Like Nota Bene, it would let you scroll through two windows simultaneously with a single keystroke. Its Go To feature would let you jump to any numbered paragraph or footnote.

You'll need WordPerfect's built-in file indexer and its QuickList of descriptively named directories. You'll need a programmable macro language that includes WordPerfect's ability to record macros that pause at a menu for input—without making you learn the program language. Your program should also track changes on the fly with automatic redlining and strikeout, and, like no word processor now on the market, it should offer the version manager in Lotus 1-2-3, Release 4, so you could recover earlier states of your text from within a single file.

TO EDIT OR FORMAT?

All current word processors make an uneasy compromise between editing and formatting. Before the PC era, the

same person rarely wrote and formatted the same document—and never did so at the same time. No one wrote an annual report at the keyboard of a Linotype machine. Today's word processor user, however, performs comparable tasks daily.

If you want your pages to look their best, your program, like WinWord 6.0, should automatically apply stylesheets to unformatted text. Like WinWord 6.0 and Versions 5.2 of WordPerfect for Windows and WordPerfect for OS/2, it should automatically enter true typographic quotation marks. It should have WordPerfect's control over word spacing, letter spacing, kerning, and ligatures (single characters that in many typefaces represent combinations of letters like "ff").

COLUMN CONNECTIONS

Like high-end desktop-publishing programs, but unlike all current word processors, your program would be able to flow text from column one to column three, with a different story, boxed, in column two. Like WinWord 6.0, it would make it easy to circle text and write notes in the margin. Its tables would let rows extend across page breaks, as Ami Pro's do.

When you've finished designing your word processor, use its e-mail features to send a copy to *PC Magazine*. It's virtually guaranteed to be named Editors' Choice. □



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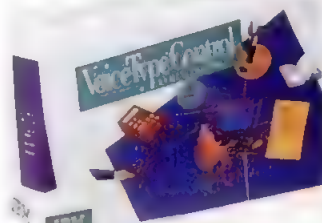
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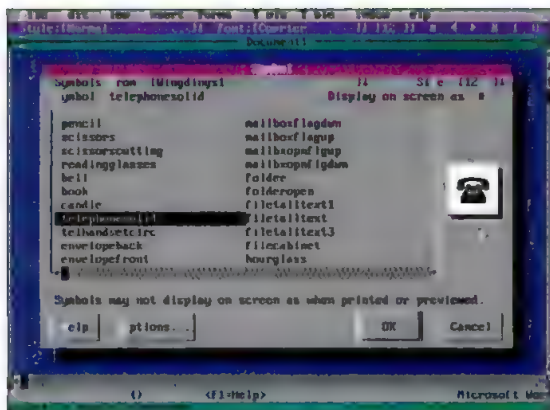
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COVER STORY

Word Processors



When you choose a TrueType character from the Insert Symbol menu in Microsoft Word 6.0 for DOS, you can't see it on the editing screen.

screen is flexible enough to display or suppress true line breaks and other layout features, and reveal or conceal hidden text. It can also switch between ordinary text mode and a special quasi-graphics mode that turns the mouse pointer into an arrow, optionally stops the cursor from blinking, and displays italics, strike-through, and other typographical characteristics. The optional ruler in both modes allows you to set tabs and margins by dragging markers with the mouse. In both modes the screen can be filled with menus, scroll bars, status bars, format ribbons, and other mouse-aware features, or

you can empty the screen to show only text.

MADE TO ORDER

Word for DOS's stylesheets, although at first slightly confusing to create, are ideally suited for customizing layouts of business letters and reports. Styles can include borders and lines, but not text. Text can be inserted automatically with macros or with the package's glossary feature, which lets you type in abbreviations that are automatically expanded when you press a function key.

Word for DOS's modest macro language allows less automation than the macro language in Windows-based products or WordPerfect for DOS, but macros are strikingly simple to create and edit. Also, merges allow a limited degree of programming. A Help menu, based on a similar feature in WinWord 2.0, guides you through the whole process.

Word for DOS has few advanced features for managing long multichapter documents, although a link feature lets you insert Word for DOS files or spreadsheets in a Word for DOS file while retaining the ability to edit the inserted files separately. The annotation feature lets multiple users attach footnotes and identify them with their initials, and the program supports on-the-fly redlining. Indexing uses a clumsy system of embedded codes that acts differently from almost all other format features.

With Word for DOS, Microsoft pioneered built-in outlining for word processors, but the package now lags behind WordPerfect and most Windows programs. You add outline numbering by selecting an outline already created and using the numbering menu, and if you change the order of the headings, you have to repeat the process to renumber the outline.

As for tables, there's a lack of built-in arithmetic functions, although you can select a column of data and tell the program to calculate a sum or product. You then have to paste the result into another cell by hand.

Among graphics formats, line art prints well, but gray-scale and color

bitmaps often produce unacceptable results. Although you can move the code that represents an imported graphic with the mouse, you have to use a menu or edit the code for resizing or precise positioning.

Printer support is more primitive than in rival packages, although Word for DOS now comes with five TrueType fonts used for printing and preview. You can import other TrueType fonts by using a menu-driven utility or by writing a batch file. A well-designed symbol menu lets you select TrueType characters by name, with a preview screen that displays an enlarged image of the character. TrueType symbols can be used for bulleted lists. Word for DOS uses a bare-bones macro for envelope printing, not the fully automated feature offered elsewhere.

You won't choose Word for DOS if

SUITABILITY TO TASK

Microsoft Word for DOS

	POWER	EASE
Letter	Good	Fair
Business report	Good	Fair
Newsletter	Fair	Poor
Long technical document	Fair	Fair

you need industrial-strength word processing or advanced graphics, but it remains one of the last word processors that is compact, easy to use, and up to date. Users of Versions 1.0 through 5.0 who refused to switch to the new menu structure introduced in 5.5 may find enough new features to persuade them to upgrade, and every satisfied user of 5.5 will find that 6.0 offers many enhancements.

Microsoft Corp.

Microsoft Word for Windows

BY JANICE STEVENSON

For the past year and a half, Microsoft Word 2.0 for Windows (and its minor upgrades, including the current one, Version 2.0c) has been the word processor to beat. Although this latest iteration (\$495) is by no means a new product, we include it here because it is still a very strong competitor in today's word processing arena. (For a more thorough evaluation of WinWord 2.0, see

FACT FILE

Microsoft Word 6.0 for DOS

Microsoft Corp., One Microsoft Way,
Redmond, WA; 800-426-9400,
206-882-8080; fax, 206-936-7329

List price: \$495, upgrade \$129.

Requires: 384K RAM (512K recommended), 1.5MB hard disk space (5.5MB for full installation), DOS 3.0 or later

In short: With Version 6.0, Microsoft Word for DOS has settled

into a useful niche as a modest but easy and effective program that does a lot with low-powered hardware and works at top speed on an up-to-date machine. Fonts, table support, and outlining are less powerful than they are in WordPerfect for DOS and full-featured Windows packages, but the program's stylesheets offer powerful ways of formatting and organizing text

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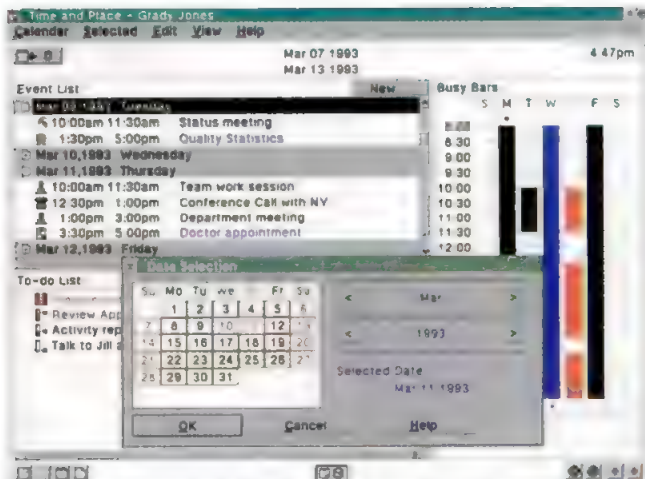
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Time.



What the Numbers Mean

DOS applications, with their low overhead and text-based interface, can lure those seeking speed above all else. But PC Magazine Labs' tests of basic word processing functions reveal that the performance advantage of DOS applications is waning. In fact, DOS applications that have built their own graphical interfaces—WordPerfect 6.0 for DOS, especially—tend to be much slower in screen-intensive operations; when loading documents in graphical mode, WordPerfect for DOS appeared to draw one character at a time. On the other hand, this doesn't mean a Windows or OS/2 application can guarantee speed.

We created a text document by saving a 100,000-byte ASCII file in each program's native format. Having done so, we found that Ami Pro 3.01 added about 75 percent overhead to the document—a problem if hard disk space is at a premium. None of the other programs added more than 25 percent.

Our small compound document (consisting of text and graphics) ended up being more than 2MB in size in Microsoft Word 2.0c for Windows. The other programs that embedded the graphics within the document file were approximately a tenth of that size. Rather than embedding graphics, Microsoft Word 6.0 for DOS and XyWrite 4.0 link to external graphics files. All versions of WordPerfect offer the user this option. In general, linking saves disk space but requires management of more files.

On our Text Print tests, WordPerfect for DOS took 2.5 times as long to print using software-based fonts as it did using the scalable fonts built into the HP LaserJet III we used for testing. No other program showed such a dramatic increase; in fact, most of the programs proved faster with the software-based fonts.

The OS/2-based applications—Describe Word Processor for OS/2, Version 4.0, and WordPerfect 5.2 for OS/2—showed some of the advantages of multi-threaded operating systems. Both programs offload printing to a new thread,

thus returning control of the console to the user faster than any other program. But in general, printing times for the OS/2 applications were slower than they were for the DOS and Windows applications.

On the other hand, the Windows Print Manager proved to be the most inefficient means of spooling printing. The Windows applications lagged behind the other programs in returning control to the user.

How We Tested

All of the products in this roundup were tested on Compaq Deskpro 486/33M units with 340MB IDE hard drives. The systems were configured with 8MB of RAM for the DOS and Windows applications and 12MB of RAM for the OS/2 programs. For the DOS, Windows, and OS/2 programs, we used DOS 6.0, Windows 3.1, and OS/2 2.1, respectively. All output was sent to HP LaserJet IIIs with 5MB of printer memory.

To set up for the text portion of our loading, scrolling, and printing tests, we imported a 100,000-byte ASCII file into each program. We formatted the text in a serifed 12-point font and set the appropriate margins to ensure that the text paginated identically in each program. Finally, we saved the document in each program's native format.

For the loading, scrolling, and printing tests, we also used a compound document, which had a 750K TIFF (Tagged Image File Format) image at the bottom of the first page and a 16K .PCX file at the top of the second page, with text interspersed.

Multiple fonts and type sizes were used. The document was then saved in each program's native format.

The **Document Load** tests measures the time it takes to load each document from a disk.

The **Scroll** tests measures how long it takes to move from the first line of the document to the last line by pressing the down arrow. We execute the appropriate shortcut key sequence to move immediately back to the top of the document and then repeat the process.

The **Print Preview** tests gauge the time it takes to move from the edit screen to a full-page, noneditable preview of the first page of the document and then to the second page and back to the first page. For programs lacking a specific print-preview mode, we measure how long it takes to zoom from a page-width view of the document to a full-page view.

For our **Print** tests, we print two versions of each document, one using fonts built into the printer and a second using equivalent, downloadable, on-the-fly scalable fonts either built into the program or provided with the operating system. We measure how long it takes from the time the print command is issued to the time control is returned to the user. We also measure how long it takes for the first and final pages to print.

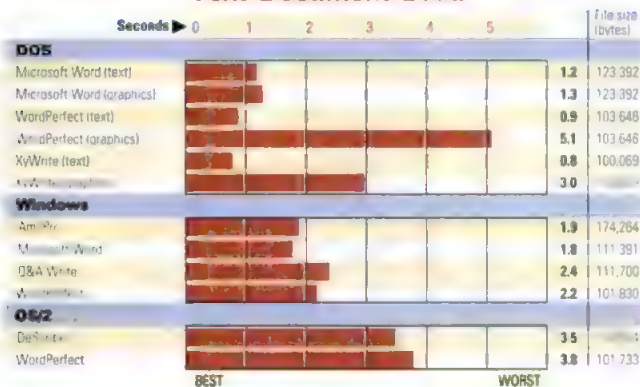
Our **Search-and-Replace** test searches the text document for the 103 instances of gun and replaces it with run.

For our **Spell-Check** test, we place ten misspellings in the text document. We then run an initial pass with the spell-checker to add to the supplemental dictionary all the words in the document that are not recognized (except for the ten intentional misspellings). After restarting the computer, we load the document and time how long it takes to find each misspelling. At each misspelling, we stop the timing when the program has offered all the suggested corrections and restart it once we have issued the command to fix the misspelled word. We stop the stopwatch a final time when the program indicates that it has completed checking the document and returned control to the user.

For the **Save File** test, we add, delete, and move small amounts of text in our large text document. We save the file under its existing filename as well as under a new filename.

DOCUMENT LOAD

Text Document Load



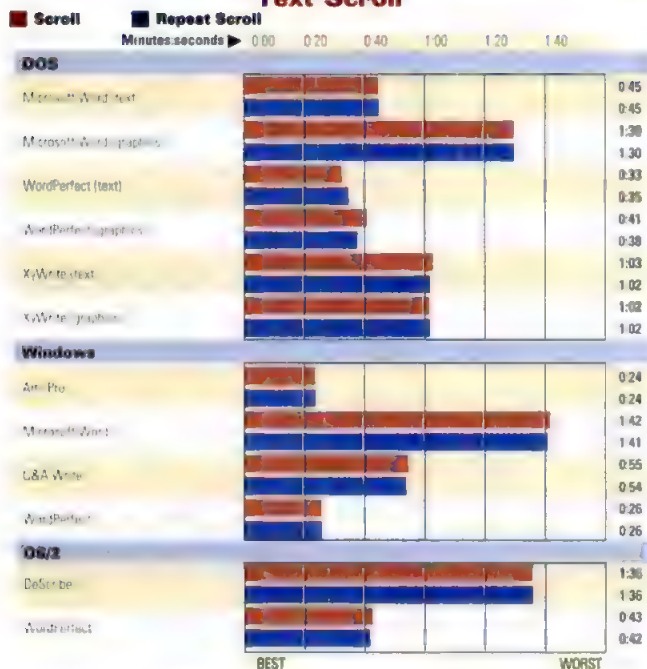
Compound Document Load



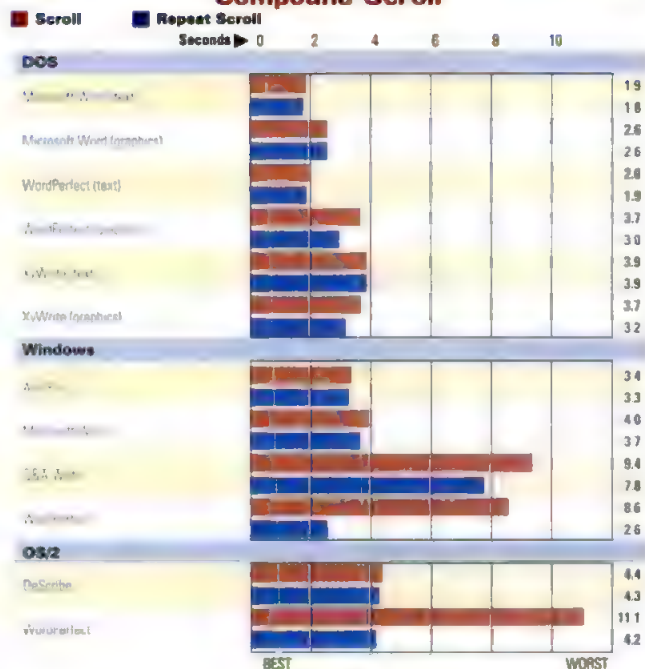
* This package creates a link to graphics rather than importing them into the document

SCROLL

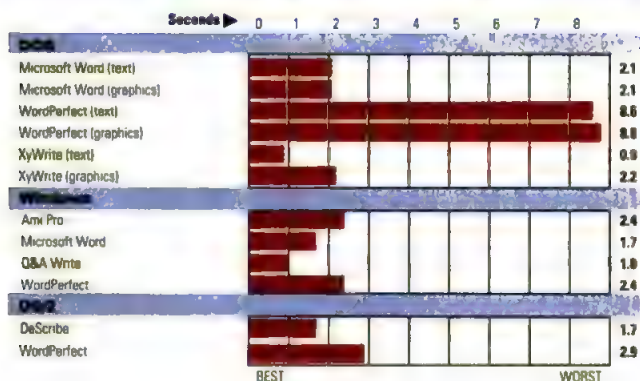
Text Scroll



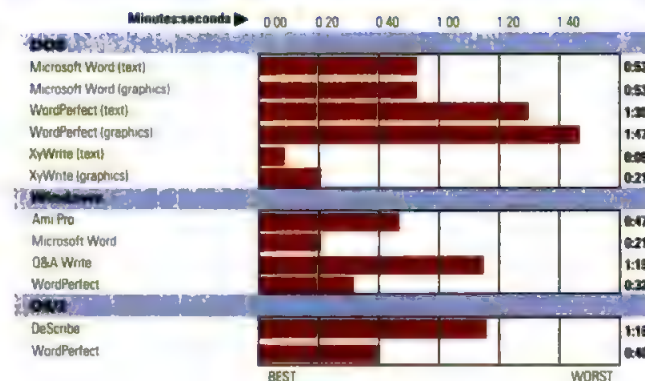
Compound Scroll



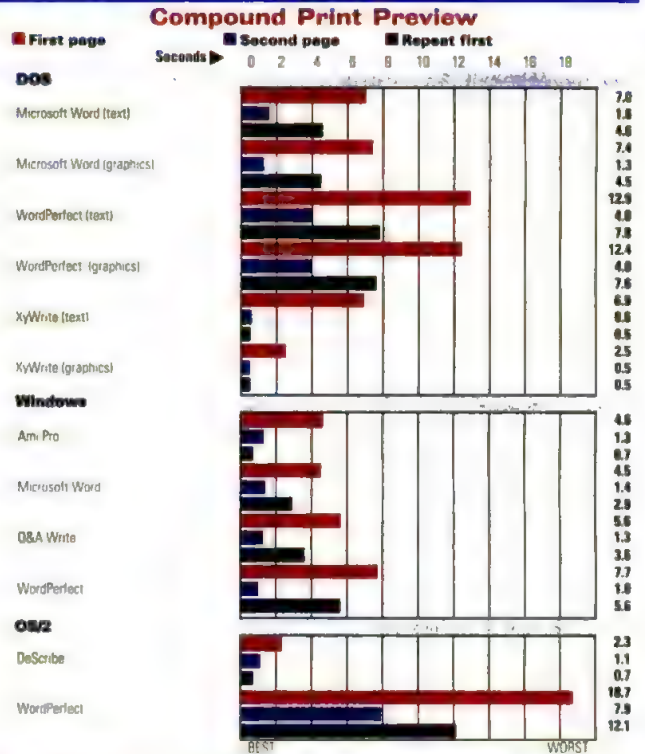
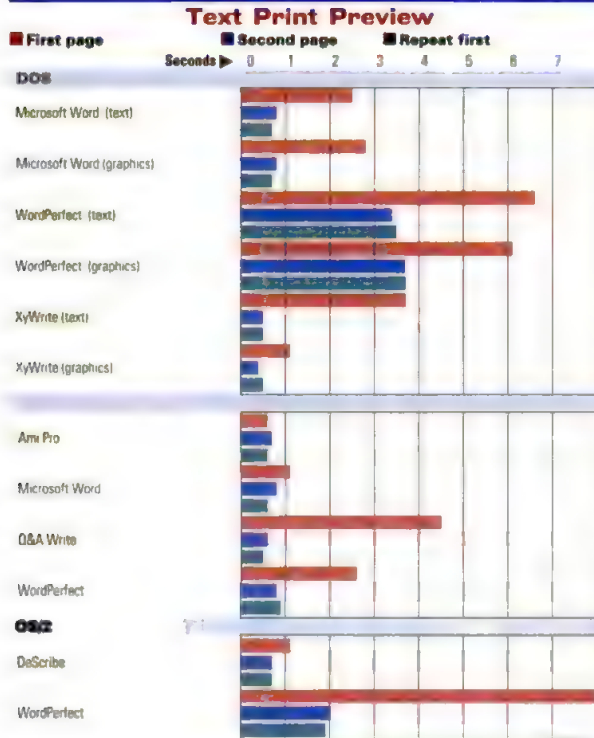
SEARCH-and-REPLACE



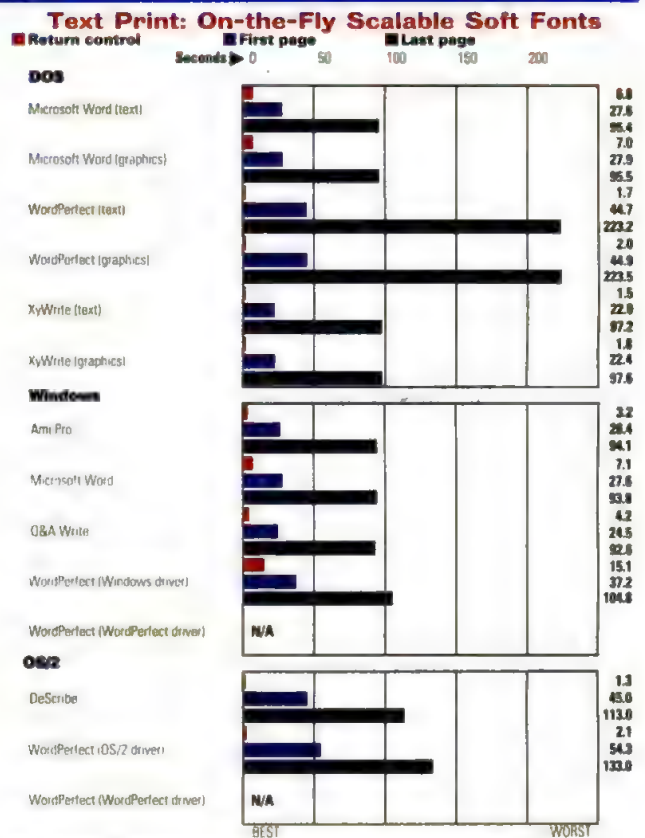
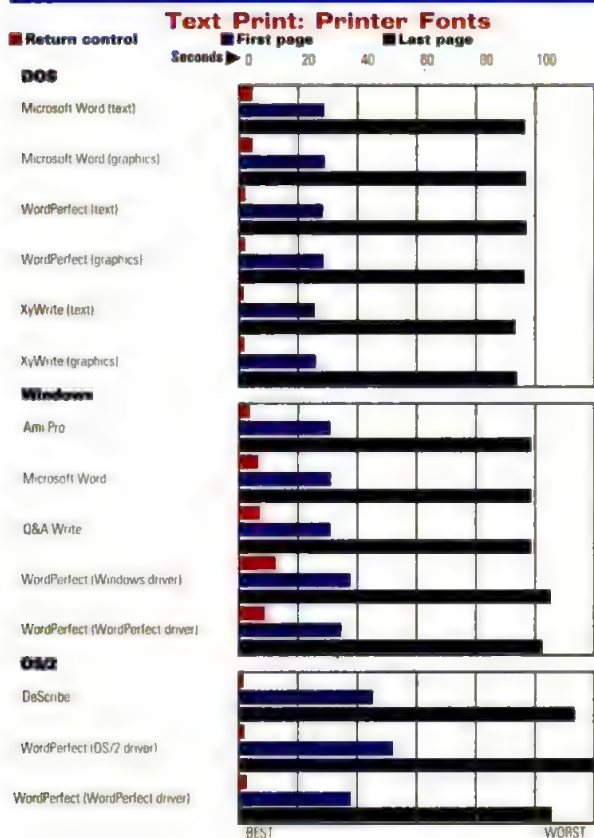
SPELL-CHECK



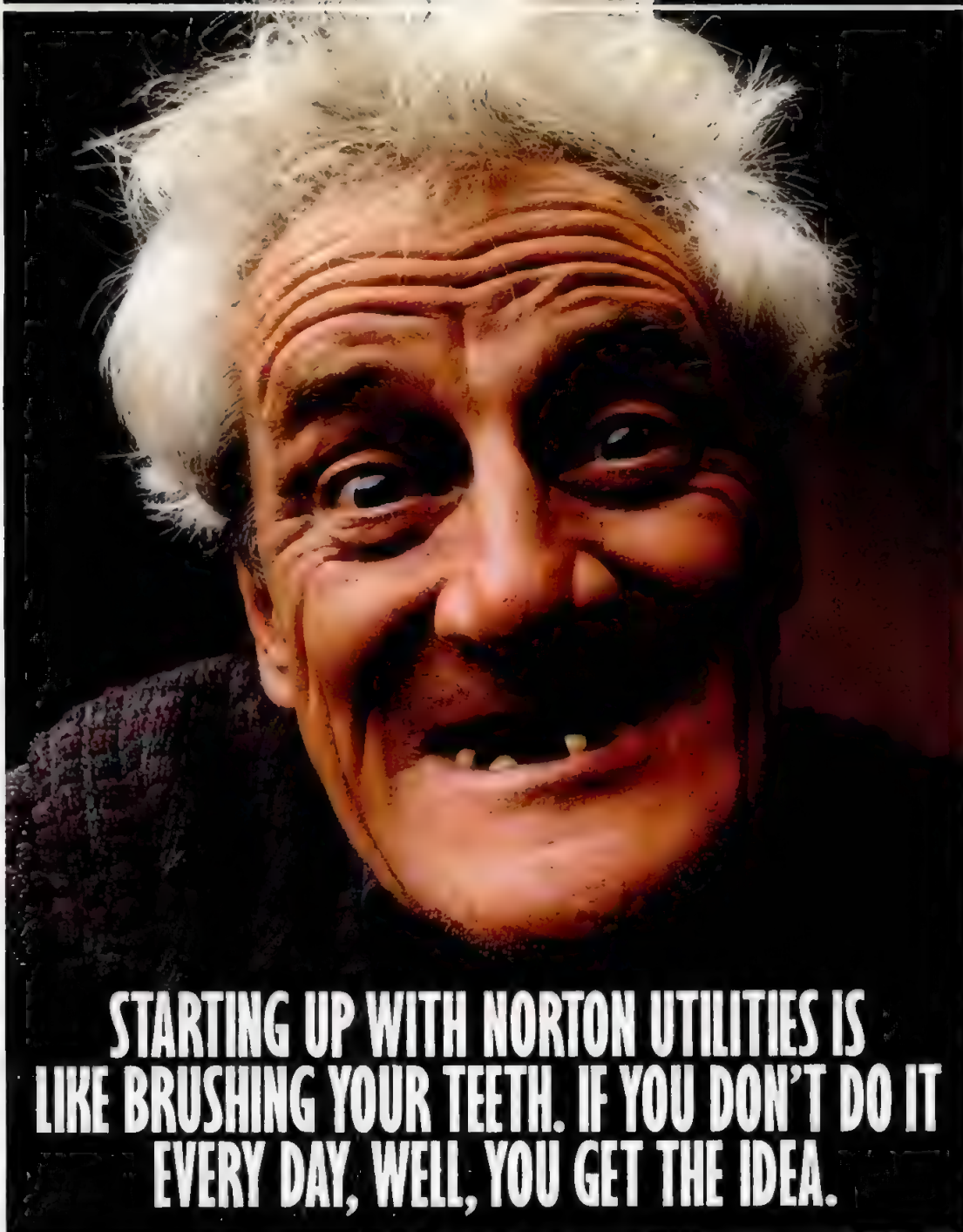
PRINT PREVIEW



PRINT



N/A Not applicable. The program does not support on-the-fly scalable soft fonts with this printer driver.



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CIRCLE 334 ON READER SERVICE CARD

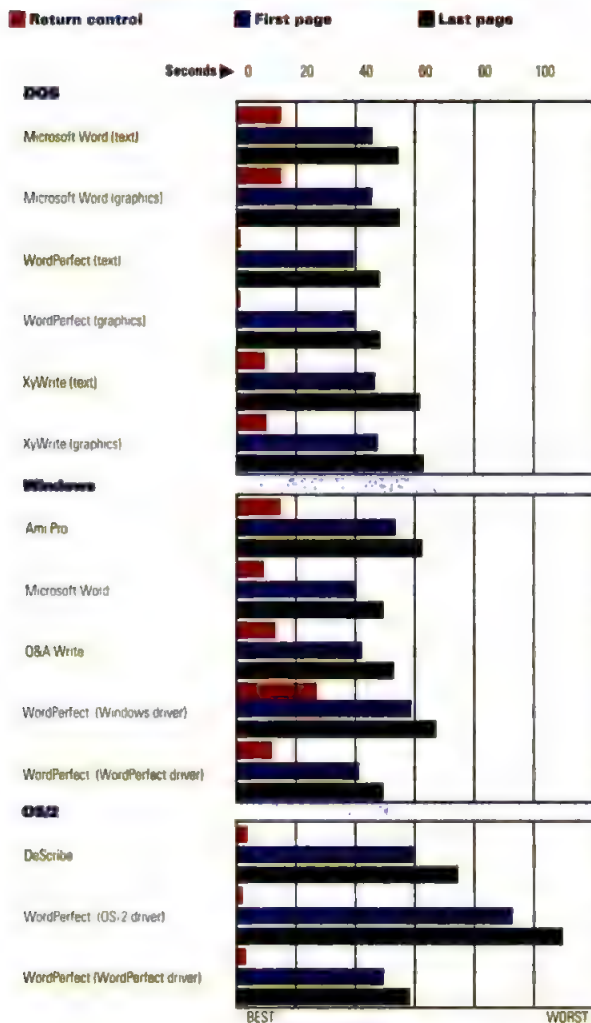


Benchmark Tests: Word Processors

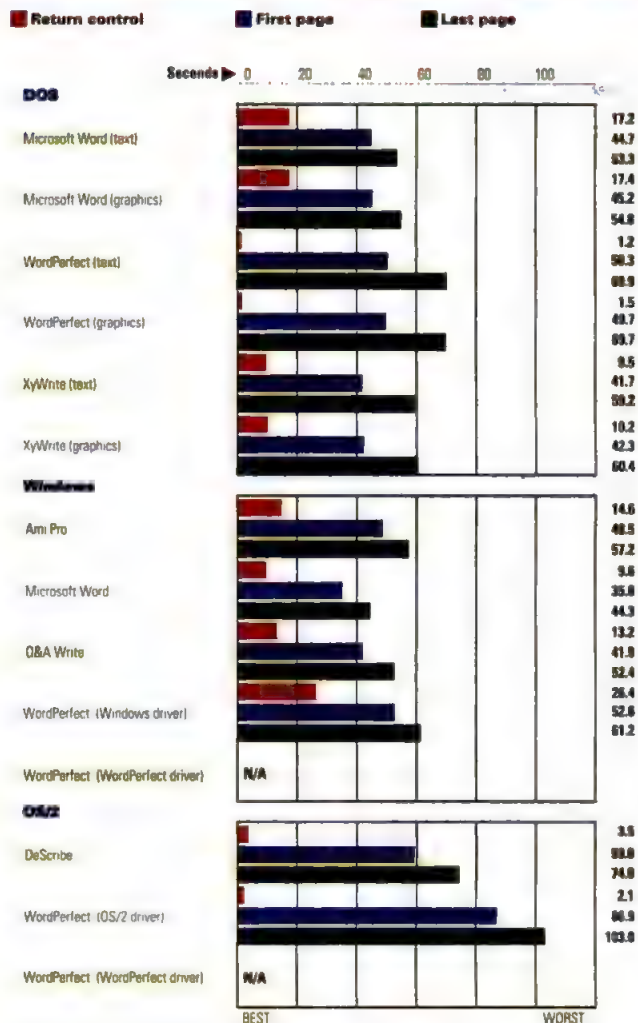
ENDS

PRINT (continued)

Compound Print: Printer Fonts



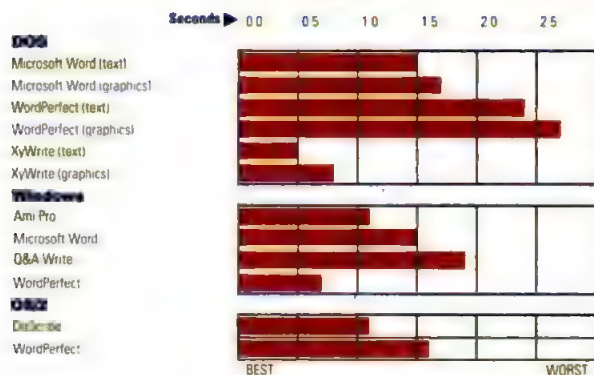
Compound Print: On-the-Fly Scalable Soft Fonts



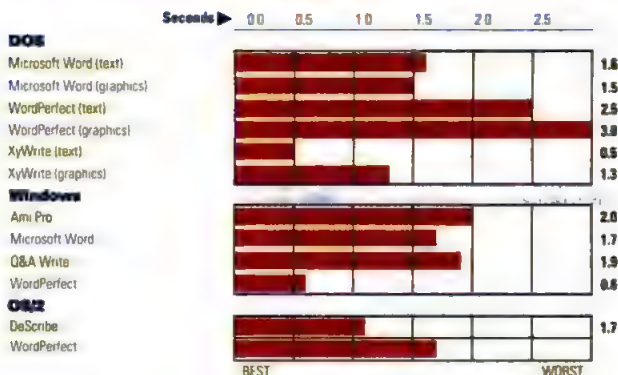
N/A—Not applicable. The program does not support on-the-fly scalable soft fonts with this printer driver.

SAVE FILE

Save



Save As



SOUNDS LIKE **THUNDER** RUNS LIKE **LIGHTNING**



September 1993
466VL MAGNUM



January 25, 1994
466 MAGNUM



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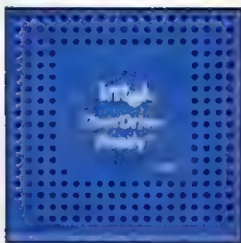
8MB RAM
245MB HD

Optional Altec Lansing ACS 300
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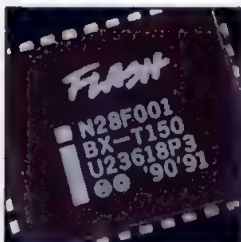
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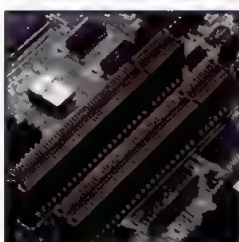
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September 1993
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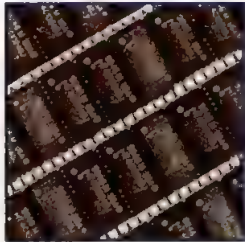
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CIRCLE 119 ON READER SERVICE CARD

the review of graphical word processors in our issue of February 25, 1992.)

WinWord 2.0 greatly simplifies the creation of typical business letters through the use of predefined templates, toolbar icons, and ribbon and ruler options. Formatting may be applied through styles or directly to individual paragraphs and phrases. We found this flexibility to be a slight advantage over Ami Pro, in which some formats can be set only through styles. But WinWord's "style bar," lets you see at a glance which styles are attached to all the text on-screen.

WinWord 2.0 handles long, complicated documents beautifully. In testing, we created a multi-chapter document using document links. The package handles all formatting and publication details through a central master document, where headers, footers, footnotes, table of contents, and index are all entered. Style changes made in the master flow to all the publication's subdocuments.

WinWord comes with miniature OLE 1.0 server applications that open separate windows on-screen when you create equations, drawings, and charts. Ami Pro's built-in graphics modules are more

flexible and integrated, and WinWord sometimes squashes graphics that you import in the middle of other text.

WinWord pioneered a hand-holding interface for print merge, and although Ami Pro now sports an even more lucid interface, WinWord's remains simple to navigate. An opening screen diagrams the whole process from creating a database to

printing the merge, and you can enter your custom data fields by selecting them from a menu. The data document is a WinWord table with special toolbar icons for managing the data. The only

important function lacking on the toolbar is one that deletes a field. To accomplish that, you have to take the extra step of returning to standard table editing. WinWord 2.0c's table feature doesn't stand up well to advanced editing.

Creating a table and typing in data is easy. In fact, the way that WinWord automatically inserts a new row when you press Tab in the last cell is pretty nice. But cells can't be set to span page breaks. Nor can column headers be marked to repeat easily from page to page; you literally have to move them into the document header and then adjust margin settings to make it look as if the column headers and data that follow were actually in adjacent rows. Cells can be merged horizontally only. Both WordPerfect and Ami Pro packages address these tasks more successfully. And heaven help you if you

need to adjust column widths after merging cells. When we did this in testing, suddenly all the columns were completely realigned—your basic nightmare. Both WordPerfect and Ami Pro address these functions more effectively. Both packages also spare you the problems that occur in WinWord if you attempt complex formatting tasks, such as adjusting column widths after merging cells (and suddenly finding that all columns in the table have completely realigned).

An area where WinWord

2.0c particularly shines is DDE (Dynamic Data Exchange) and OLE (Object Linking and Embedding). During testing, we successfully connected files from other applications to WinWord 2.0c in a variety of ways, specifying if the links should update automatically or manually. When connected to other Microsoft products, WinWord 2.0c could update links without even opening the other application.

Despite being a standing target for roughly 18 months, WinWord 2.0c has lost little if any ground to its competitors; it remains a top player by any measure.

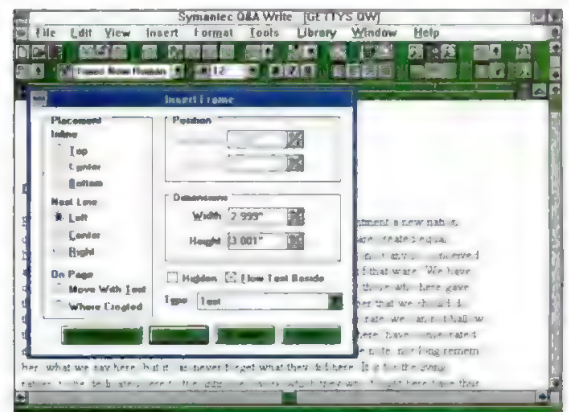
Symantec Corp.

Q&A Write for Windows

BY ANGELA HICKMAN

Popular wisdom maintains that bigger is better. This may be true for paychecks and diamonds, but it doesn't hold for Symantec Corp.'s Q&A Write, Version 3.0 for Windows. With a clear "less is more" outlook, Q&A makes good use of a scanty 4MB of hard disk space and an array of features, which include support for graphics, OLE (Object Linking and Embedding), DDE (Dynamic Data Exchange), and mail-merge.

Previously known as JustWrite, Q&A specializes in creating letters and short documents simply and quickly, through a straightforward interface. Q&A's quick installation and succinct manual are extra perks. But if awesome power, serious automation, and complex functionality are what you're looking



Q&A Write for Windows lets you insert text in graphics and frames to control the dimension and position of each framed item.

FACT FILE

**Microsoft Word 2.0c
for Windows**

*Microsoft Corp., One Microsoft Way,
Redmond, WA 98052; 800-426-9400,
206-882-8080; fax, 206-936-7329*

List price: \$495

Requires: 2MB RAM, 5MB hard disk space (15MB for full installation), Microsoft Windows 3.0 or later

In short: Microsoft Word 2.0c for Windows remains a top-of-the-line product despite its age, combining powerful formatting, extensive style capabilities, comprehensive outlining, and a strong master document feature to produce sophisticated documents. The table feature could stand some beefing up to include vertical-cell merging

In sum, the product is flexible and easy to use

444 ON READER SERVICE CARD

Building Word Processing Apps

by Janice Stevenson

Once again you're staring at the blank white screen of your word processor, trying to remember if the horizontal line on your standard memo is 6 or 6.5 inches and wishing the line would just be there when you need it. Well, it can be, and so can your name, the date, and even your company logo. The automated creation of standard document layouts is the cornerstone of application design in word processors. All of today's top word processors—Ami Pro, Version 3.01; Microsoft Word 2.0c for Windows; and WordPerfect 6.0 for DOS—provide extensive development tools. In this article, we'll give an overview of each word processor's tools and some hints on getting started with them.

Custom applications can vary from a simple memo layout to a highly sophisticated travel-and-expense voucher that automatically totals line items and performs currency calculations. Because up-to-date word processors can utilize advanced typography, and because today's office laser printers produce clean and crisp images, many forms that used to be professionally printed can be produced on the fly from the PC—complete with inserted data! Customized word processing applications can control just about any aspect of document production.

More and more large corporations are placing standard document forms within their word processing environments, which ensures standardization. Such forms frequently incorporate objects from other software applications, such as spreadsheets, databases, and graphics applications.

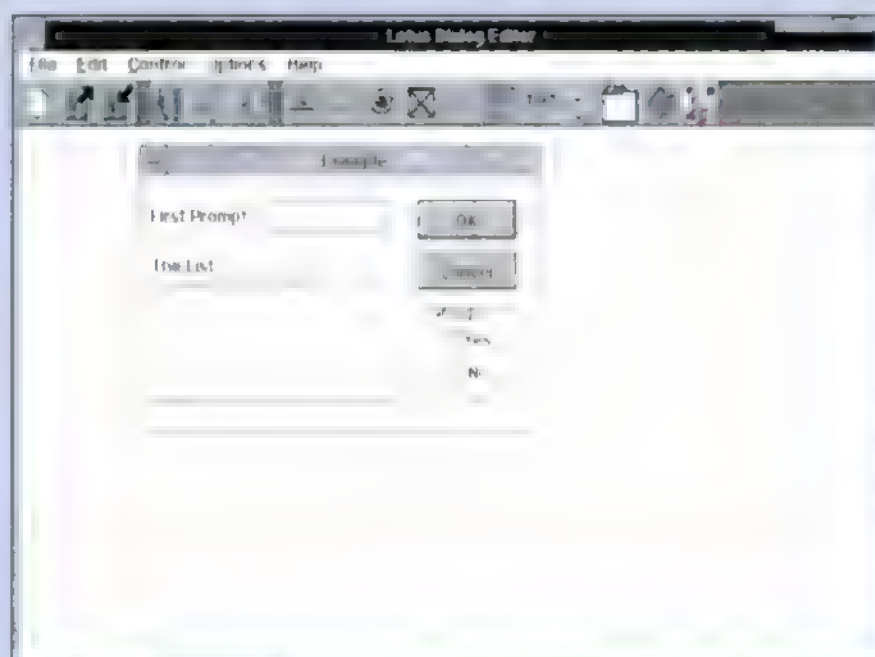
Furthermore, forms often record standard information that is particular to individual users so that less data

entry is required on a given document.

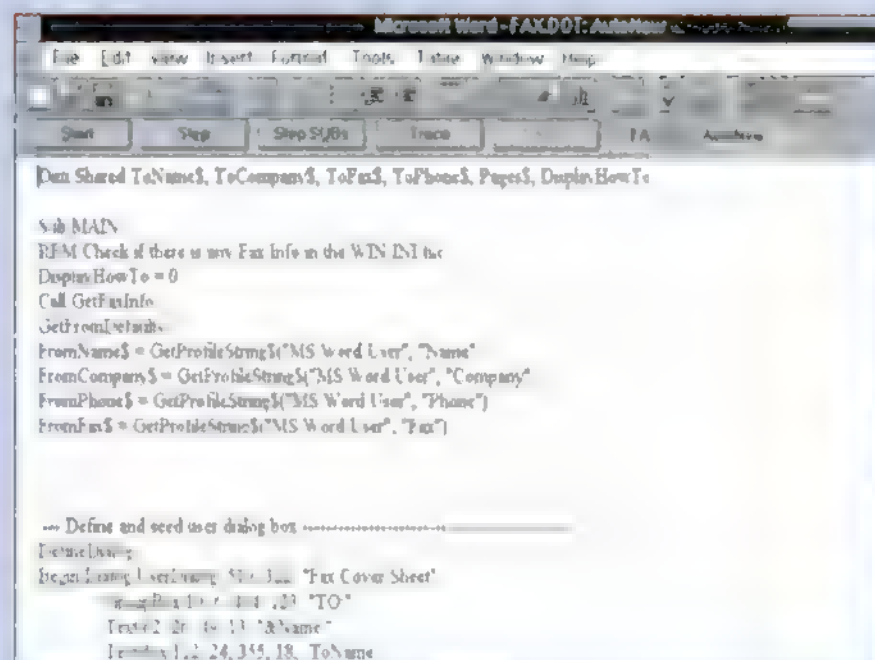
LOTUS

Ami Pro 3.01 contains a powerful macro language consisting of some 450 different functions divided up as follows: 7 for variable assignment, 50 for strings, 18 to control menus, approximately 250 for basic word processing, 29 for Windows interaction, 19 for controlling frames, 16 for styles, 17 for page layout, 9 for dialog boxes, 8 for arrays, 8 for addressing DOS files, 18 for NewWave interaction, and 9 for DOS commands. The language also contains five commands to control program flow.

Included with Ami Pro is the Lotus Dialog Editor, which lets you design a custom interface and automatically generate the code to display it. The same dialog editor functions within Lotus 1-2-3 for Windows, building a natural bond between the two Lotus products. The roughly 100 standard macros that ship with Ami Pro serve as excellent examples of code, and you can borrow from them, since copying and pasting between macros are as easy as



Using the Lotus Dialog Editor in Ami Pro, you can quickly and easily create sophisticated user interfaces.



WinWord's Macro Bar facilitates easy troubleshooting by allowing complete macro control from any document window.

between normal documents.

Unfortunately, printed documentation for Ami Pro's macro language does not ship with Ami Pro itself; you must order it separately. Even though the word processor's on-line help includes some help on macros, producing sophisticated custom applications without the documentation is still difficult, so it's definitely a good investment for anyone interested in serious development.

The language documentation lists all the commands and their syntax and provides examples. Troubleshooting information, on the other hand, appears only in on-line help. Changes to a macro must be saved before testing, because Ami Pro reads the macro off the disk during playback. To debug your application, you must enter the "SingleStep" function into the code.

MICROSOFT

Like Ami Pro, Microsoft Word 2.0c for Windows contains a robust macro language. Called WordBasic, it weighs in with approximately 480 functions divided in proportions similar to those in Ami Pro's language. Like Ami Pro, WinWord 2.0c contains a dialog editor, which eliminates the task of generating interface code directly.

Significant differences in working with the two languages come to light in connection with debugging. WinWord 2.0c's Macro Testing Bar makes it unnecessary to add the debugging commands to the macro itself, as you must with Ami Pro. The bar is active as long as a macro is open (even when you're viewing another document), so it's quick and easy to step through the macro (execute it one line at a time to isolate problems) at any time. Since word processing macros often insert text in the open document, controlling execution of the code from the target document is very helpful. If it encounters an error, WinWord 2.0c marks that line of code in red. Changes to the macro code do not have to be saved before testing, which speeds up the debugging process; you save it once you've got it working.

Microsoft's policy with regard to documentation is similar to Lotus's: The WordBasic reference materials don't ship with the application either. WordBasic help is available within WinWord 2.0c's on-line help, but flipping between the help and edit screens quickly becomes tedious.

Microsoft has recently announced a migration toward a single standardized programming language—Visual Basic for Application—that all its applications will use for customization, linking, and application building. When this scheme is realized, an accomplished VBA programmer's skills will be applicable to the full suite of Microsoft applications, as well as to cross-application development.

WORDPERFECT

The third big player of the moment is WordPerfect 6.0 for DOS. Its macro language approaches the power of Ami Pro 3.01's and WinWord 2.0c's. The command syntax of WordPerfect 6.0 resembles that of the other two applications much more closely than the language supplied with earlier versions of WordPerfect, which relied far more heavily on recorded keystrokes than on flexible language commands. It is not,

however, an equal player—yet.

For one thing, as a DOS program, WordPerfect 6.0 has limited connectivity to other applications. For another, there's an overabundance of specific macro commands. WordPerfect 6.0 contains in excess of 1,200 commands—more than twice the number boasted by WinWord 2.0c and Ami Pro 3.01. The bulk comes from WordPerfect's use of separate commands where the others use a single command with multiple arguments (parameters).

Furthermore, WordPerfect 6.0's dialog boxes must be laboriously defined by many lines of code—in contrast with the quick, no muss, no fuss dialog editors supplied by Lotus and Microsoft. And writing the code

Invoice Date: December 22, 1992 Invoice

Client:

Hours	Service provided

Invoice Number

Update the Invoice Number:

Client Information:

Name:

Address:

Total Amount:

In addition to placing client information, this automated invoice form prompts users to enter hours and rates.

for a dialog box means a lot more fiddling in order to obtain the desired look. Finally, documentation for WordPerfect 6.0's macro language is available *only* within the on-line help. And even there it's not organized by functionality; it's organized alphabetically. So if you know the general nature of the command but not the name, you're in for a lot of screen reading. It's great to be able to pick up the odd piece of information on-line; depending on on-line help for all information is a drag.

PROGRAMMING SAVVY

Becoming a macro programmer is best approached in stages. First, use your

package's keystroke-recording feature to record a few simple sequences based on things you do often. Because you know the keystrokes, the resulting macro code will probably be easy to follow. Next, examine the macros that ship with the application. Ami Pro 3.01, WinWord 2.0c, and WordPerfect 6.0 for DOS all come with a complement of macros that you can study and learn from—as well as use.

Finally, begin to write your own code. Keep in mind that you can still record keystrokes and paste them into a larger macro. You can borrow from the shipped macros using cut-and-paste, too.

The written macros represent only part of the application-design picture within word processing. The model documents, called templates or stylesheets, frequently perform part of the automation, independent of macro programming. All three word processors discussed here calculate table formulas, provide bookmarks for finding specific locations within the text, and include fields that automatically update. These elements, connected with the commands of a macro, govern every aspect of document production.

When Visual Basic for Applications begins shipping—first with Excel 5.0—and when LotusScript moves from its current subset in Lotus Improv to its full-blown status as a cross application macro language for Lotus products, the applications-development landscape will change significantly. For the first time there will be a consistent macro language that can be shared across all of your applications..

Now you can stare at your macro editor and start thinking about all of the cool ways you can get your word processing program to do the work for you. □

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We've put the incredible processing power of the new Intel 486™ DX2 into our most affordable line of notebooks.

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- 120/200MB HDD
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- 9.5" Dynamic-STN dual-scan color screen
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- Under 7 lbs.

T1950CT

- 8.4" color active matrix TFT-LCD screen
- 120/200/320MB HDD
- 7.4 lbs.

ALL MODELS

- Intel 486™ DX2/40MHz, 3.3v
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- 8KB cache
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- BallPoint® Mouse 2.0 with QuickPort™
- NiMH battery with Toshiba MaxTime™ Power Management



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\$99

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The ISP-16 is big news for cost-conscious users. At just \$99, you can buy two boards for the price of one Sound Blaster 16. And the features are identical. Both have 16-bit stereo sound, record and playback, 20-voice FM synthesis and CD-ROM interface. But only our ISP-16 supports popular Sony CD-ROM drives. Get our professional quality ISP-16 for a game-board price. Or upgrade to the ISP-16 Sound System, complete with CD-ROM drive, custom speakers and popular CD-ROM titles for hundreds less than our competition.

Enhance your multimedia experience with DSP-16 — For affordable, high-performance sound.

MediaMagic Digital Signal Processor (DSP) boards offer quality digital audio at affordable prices. You get 16-bit, 48kHz stereo, a CD-ROM interface and a

joystick/MIDI port all in one package. Unlike other boards, the DSP-16 is compatible with AdLib, Sound Blaster, Business Audio, Windows Sound System and MPC-2. DSP-16 will also support future audio standards with a simple software upgrade while other boards just become obsolete.

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We've combined our powerful MediaMagic audio boards with Sony and Toshiba CD-ROM drives, high-quality stereo speakers and popular CD-ROM titles for turnkey multimedia solutions that are powerful, affordable and easy to use.

Products:	Digital Audio	Up-grades	Wave Table	CD ROM	Real-Time MPEG Audio	Price*
MediaMagic™ DSP-16 Plus	16-bit 48 KHz	Yes	Standard	SCSI	Yes (encoder/decoder)	\$259.00
Sound Blaster 16 ASP	16-bit 44 KHz	Yes	Expensive Upgrade	Proprietary	No	\$349.95
ProAudio Spectrum-16	16-bit 44 KHz	No	No	SCSI	No	\$299.00

*Base SRP



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It pays to upgrade your system! Purchase one of our DSP audio boards, send us your old 8-bit board by January 31, 1994 and receive up to \$50 cash back. Price. Performance. Upgradeable. And a generous trade-up program. When multimedia sounds too good to be true, it's no trick. It's MediaMagic™. For your nearest dealer, or for more information, call:

800-624-8654

for, then unfortunately, Q&A Write will leave you hanging.

MINIMAL FACE

Q&A's interface is consistent with its fundamentally minimalist approach. Unadorned yet functional, it provides pull-down menus, keyboard shortcuts, a tab ruler, and a customizable toolbar. You might want to memorize the toolbar, though, as the buttons are too small to read easily. On the other hand, you can get an explanatory cue for any icon by right-clicking with the mouse.

If you want to create a letter or short document, Q&A will handle the job with aplomb. It comes with 11 predefined templates such as fax cover sheets, memos, resumes, and letters, and you can create an unlimited number of user-defined templates to simplify everyday tasks. Don't be misled, however: *Template for Q&A* simply means a document that you can copy over and over as needed. It has no intelligence and will not prompt you for information as do templates in Ami Pro and Microsoft Word for Windows.

Creating styles in Q&A is a bit confusing. You first format the desired text, using character, paragraph, or document-formatting options. You then install the result in the Q&A Library. Applying a style is easier: You highlight

the text and double-click the style of your choice from the Library pick list. Unfortunately, styles can't be modified once saved, so you can't globally change formatting.

EASY MAIL

Q&A's mail-merge is a breeze to use, if limited in power. It prompts users with a series of menus that speed the process along. You simply insert the desired merge fields wherever they're needed in the main document and then select a database from which to merge. Q&A can import from ASCII, dBASE, Paradox, and Q&A for DOS databases. But if you want to create a database file from scratch, you'll have to create a tabbed ASCII merge-data file—not easy in Q&A.

With Q&A's Retrieve Spec dialog box, you can retrieve groups of specific records. You can't, however, mark random records for a merge. A Sort button lets users specify the order and criteria by which records are printed. Envelope printing, new in Version 3.0, is one of Q&A's easiest features to use.

HOW LONG IS LONG?

Because Q&A is so good at the basics, such as creating letters and printing envelopes, its attempts at high-end functionality seem to fail all the more dramatically. For example, longer, more technical documents are troublesome for Q&A. Q&A does not provide master document facilities like those found in Ami Pro or WinWord, so users have to insert chapters or segments of text manually. Q&A used to support tables of contents and indexing, but they are missing from this version. Also missing is a macro facility.

And although Q&A supports a wide array of graphics formats—including Lotus .PIC, Macintosh .PICT, Metafile, .PCX, .PGL, TIFF, and WP Graphics—working with graphics on the page can

be tedious. Graphics live in boxes called frames. To reposition or resize a graphic, you must place it on the page and, rather than dragging it to its new size or location directly, double-click the frame, whereupon Q&A will take you to a special editing window to make your changes.

Q&A has a simple table function that includes a few limited mathematical functions such as Sum Cell Data and Average Cell Data. Tables require frames. Q&A also supports outlines

and columns.

Q&A write's test performance ranged from mediocre to poor with one exception. It had an especially good score in the Search-and-Replace speed test. Its poor performance in the compound document scroll underscores the fact this is not a word processor for long, complex documents.

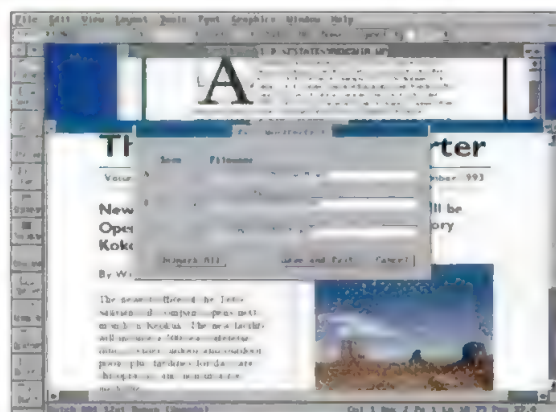
Q&A does a limited number of things well and is for the most part easy to use. If you're looking for simplicity, not diversity, and don't have the disk space for a powerhouse like WinWord, this package may be for you.

WordPerfect Corp.

WordPerfect for DOS

BY EDWARD MENDELSON

Whatever the word processing task you need to do, you can probably do it in WordPerfect for DOS. Version 6.0 (\$495)



When you exit WordPerfect 6.0 for DOS, a menu lets you save all files or a selection of files with one keystroke.

FACT FILE

**Q&A Write, Version 3.0
for Windows**

Symantec Corp., 10201 Torre Ave.,
Cupertino, CA 95014; 800-441-7234,
408-253-9600; fax, 408-446-9750

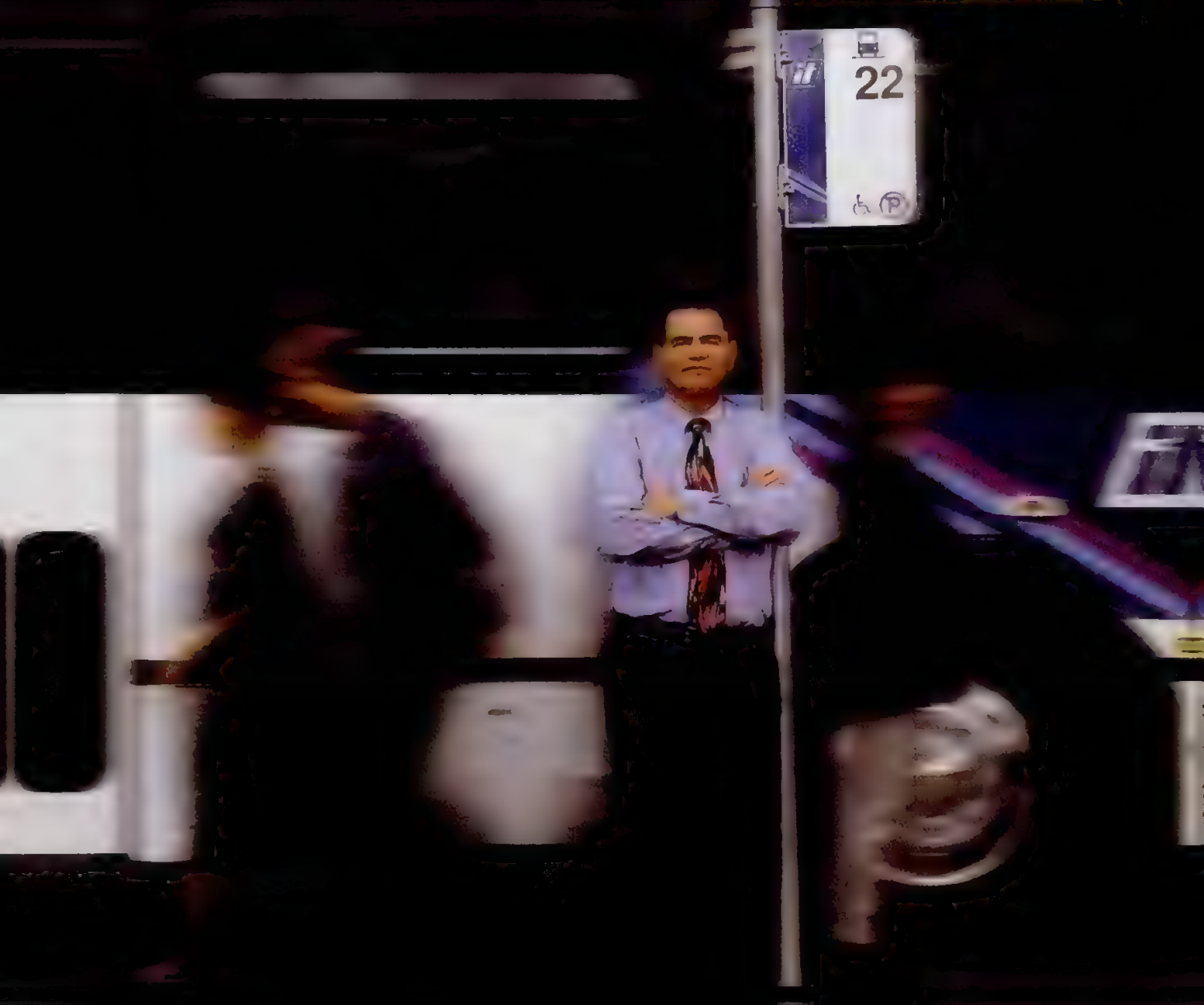
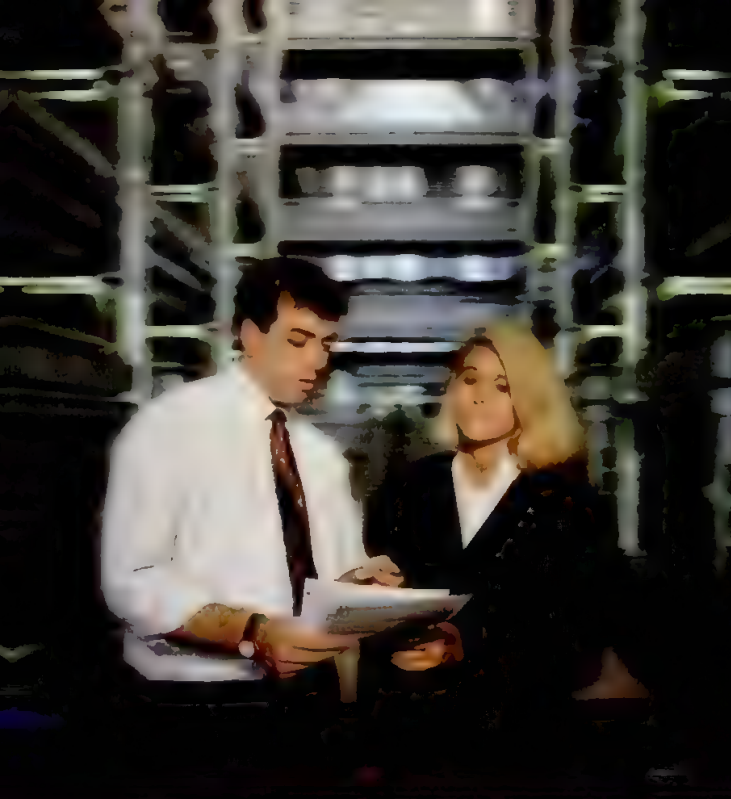


List price: \$69.95

Requires: 2MB RAM, 1.7MB hard disk space (4MB recommended), Microsoft Windows 3.1 or later

In short: If your needs are basic, Q&A Write, Version 3.0 for Windows, may be the word processor for you. Priced at just \$69, this word processing package attempts high-end functionality without breaking your wallet. Keep in mind, however, that you get what you pay for; it's best just for short-document and letter creation

ON READER SERVICE CARD



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You may have heard that the introduction of the Microsoft Access® database management system was incredibly successful. In fact, we've now shipped over a million copies. What you may not know is that this relational database for the Windows™ operating system is being used worldwide in a number of imaginative ways. Once you hear these success stories, you'll want to create one of your own.

Now everyone can get access to data.

The Commercial Office Supply Division at 3M® is always on the lookout for new product ideas. After all, the next Post-it™ note could be right around the corner. But until recently, they were missing a way to organize all of the "product wishes" floating around their department into a format everyone in the group could easily share and use.

"Our information was in a variety of locations: filing cabinets, notebooks, people's heads," recalls Bob Wolf, 3M Product Development Engineer. "The business problem we had was not being able to access our information effectively." They chose Microsoft Access to build their database of ideas, maintain mailing lists, generate surveys, and more. "It saves time in training, in building the databases, and it saves time in accessing the information." Which leaves more time to concentrate on turning wishes into the products people want.

Managing data and reporting are easier.

Scott Emmons, Professor of Molecular Genetics at Albert Einstein College of Medicine, spends a lot of time with worms. Thousands of them. As a basic research tool, nematode worms are a valuable part of learning how DNA forms the blueprint for life. For Scott, managing the variety of data associated with each different mutant worm strain—and being able to generate reports on his research quickly—is critical to keeping his lab running smoothly. He turned to Microsoft Access.

"A major part of the way I'm using Microsoft Access is the reports that I generate," says Scott. "I can sort the data a number of ways, and the ease of use means I can quickly scan these reports to locate a particular strain." And that means a lot less strain on Scott.

The uses are endless.

Intercity Transit in Olympia, Washington, recently moved from Paradox® because of the superior reporting capabilities in Microsoft Access, and its interoperability with other Microsoft applications. "To go with our suite of Microsoft® Office products, we felt it was the best choice for us," explains Richard Madrid, Intercity Transit MIS Specialist.

Today, Intercity Transit relies on Microsoft Access to keep them running—literally. By using it to maintain

and generate timetables for bus riders and drivers, they've all but eliminated scheduling errors, and saved countless hours of proofing and information-transfer time. Plus, they can track ridership by customer segment and keep tabs on the productivity of every route. Now they plan to use Microsoft Access to help grow their rideshare program.

"Microsoft Access has given us a lot of capabilities, not just report writing, but access to the data, and configuring it the way we need it for reporting and tracking," notes Richard. "Plus it's easy, so people are happy." And that's bound to keep Intercity Transit headed in the right direction.

Now everyone in your organization can work smarter—if they work with Microsoft Access. If you use another database or any Microsoft Office program, you can take advantage of our special \$149** offer today, which includes a 90-day money-back guarantee. Then you can create your own success story. When you do, we'd love to hear it—simply write to: Microsoft Access Product Manager, One Microsoft Way, Redmond, WA 98052.

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or to order by phone,
call (800) 894-6636, Dept. KS9.**



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of this classic retains the efficiency and precision of earlier DOS-based versions, while adding true WYSIWYG editing, a built-in spreadsheet, and a file indexer that instantly retrieves a needle of data from a multimegabyte haystack. The new version has awkward patches and needs powerful hardware and careful memory management to realize its full potential, but it ranks as the most powerful application ever written for DOS, with conveniences that rival a fully equipped Windows setup.

The new version's default text-mode editing screen looks like a double of the

one found in WordPerfect 5.1 for DOS, although the optional mouse-enabled pull-down menus now access Windows-style dialog boxes. Two keystrokes switch you to either a graphics mode or a full-page mode that displays footnotes and headers in place but makes you go through a menu to edit a note or header, rather than letting you simply click on it. Both of the graphics modes are slower than the text mode, although imported images display quickly. All editing modes can display nine files at once, and the print preview screen shows up to 255 thumbnail pages. All views include

optional button bars, formatting ribbons, and scroll bars—but, surprisingly, no rulers.

FONT HEAVEN

The font and printer support surpasses that of all other programs and platforms. You can display and print all major scalable font formats—TrueType, Type 1, Speedo, and Intellifont—complete with automatic kerning. The unique 1,500-strong character set, which includes phonetic symbols and dingbats, guarantees that any printer will print any foreign, technical, or typographic character. You

• Ultracheap Word Processing

Is it really necessary to spend a hundred dollars or more to find word processing?

by Don Trivette

To answer that question, we looked at three DOS-based word processors selling for under \$25. Although you might not use a low-end word processor to write a corporate newsletter, it may be all you need for school papers, light business correspondence, and personal letters.

Swift Word Processor from Cosmi Corp. is attractive and easy to learn, and it costs just \$9.95. It's suitable for grade-school reports, office memos, and letters. Commands are available via pull-down menus and Alt-key combinations. The Edit Ruler menu has provisions for setting margins, headers, and footers. Other features include search-and-replace, block-move, copy, and delete functions. The most glaring omission is a way to underscore, boldface, or italicize text, although there is a text-centering command. There is a parameter to set page length, although page breaks don't show up on-screen and can't be forced where you want them to be. The spell-checker reports misspellings but does not suggest correct words.

Easy Working: The Writer, from Spinnaker Software Corp., provides a good feature set for its \$14.95 price tag. Commands can be accessed via

pull-down menus or Alt-key combinations. Using the Layout menu, you have the option to align and center text, force page breaks, establish single and double spacing, and set margins, headers, footers, and tabs. A Typeface menu makes it easy to boldface, underline, and italicize text. Other features include search-and-replace and block cut-and-paste commands. The Writer displays documents as they will appear in print, including page margins and breaks. You can piece together text from different documents, and the default directory can be easily changed.

The Writer's spell-checker is weak; it flags all hyphenated words and does not suggest corrections.

Webster's Word Processor (no relation to the dictionary) costs \$24.95 and is a mouse-compatible offering from Cosmi. The package is relatively full-featured and suitable for all word processing tasks.

Commands can be selected from pull-down menus or with Alt-function key combinations. In addition to offering search-and-replace, cut-and-paste, and on-line-help features, Webster's supports text-formatting combinations like italic underlines and superscripts. It handles longer documents with ease

and includes tracking for widow and orphan control. Other strengths are the 100,000-word spell-checker, which suggests correct spellings, and a 600,000-word thesaurus. □

► FACT FILE

Swift Word Processor
Cosmi Corp., 2600 Homestead Pl.,
Rancho Dominguez, CA 90220; 310-
833-2000; fax, 310-886-3500.
List price: \$9.95.
Requires: .3MB hard disk space, 256K
RAM, DOS 2.1 or later.

Circle 463 on reader service card

► FACT FILE

Easy Working: The Writer
Spinnaker Software Corp., 201
Broadway, Cambridge, MA 02139;
800-826-0706, 617-494-1200; fax, 617-
494-1219.

List price: \$14.95.

Requires: .5MB hard disk space, 384K
RAM, DOS 2.0 or later.

Circle 464 on reader service card

► FACT FILE

Webster's Word Processor
Cosmi Corp., 2600 Homestead Pl.,
Rancho Dominguez, CA 90220; 310-
833-2000; fax, 310-886-3500.
List price: \$24.95.

Requires: 1MB hard disk space, 1MB
RAM, DOS 3.2 or later.

Circle 465 on reader service card

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FEATURE SUMMARY

	ViewSonic 15	ViewSonic 17	ViewSonic 20	ViewSonic 21
Screen Size	15"	17"	20"	21"
Dot Pitch (mm)	0.28	0.27	0.28	0.25
Horizontal Frequency (KHz)	30-64	30-82	30-82	30-82
1600 x 1280 Non-Interlaced		■	■	■
Maximum Refresh Rate (Hz) at 1280 x 1024 NI	60	76	76	76
Flat Square Screen	■	■		■
ViewMatch™ Color Control	■*	■	■	■
Low Radiation (MPRII)	■	■	■	■
Suggested List	\$549	\$1,299	\$2,099	\$2,399

CIRCLE 118 ON READER SERVICE CARD

ViewSonic®

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Tel. (909) 869-7976 Fax (909) 869-7958

ViewSonic 21 screen image by SPATIEL TECHNOLOGY INC., Boulder, CO. Created with ACTS™ Geometric Modeler and rendered with Visualization Hawk.

*Color temperature select 9300°K or 6550°K only.

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**ViewSonic 15
Reduced to
\$549
(MSRP)**



**COMDEX
Booth L2858**



► **SUMMARY OF FEATURES**

Word Processing Software

Products listed in alphabetical order

■ = YES □ = NO

	 Ami Pro	DeScribe Word Processor for OS/2	Microsoft Word for DOS	 Microsoft Word for Windows	Q&A Write	 WordPerfect for DOS
List price	\$495	\$495	\$495	\$495	\$69	\$495
Network-ready	■	■	■	■	■	■
Cost per additional user on network	Varies	\$495	\$425	\$395	No extra cost	\$295
Operating system(s)	OS/2, Unix, Windows	OS/2	DOS	Windows	Windows	DOS

Memory and Disk Usage

Uses expanded memory	■	□	□	■	□	■
Disk space used by default installation	15MB	12MB	5.5MB	15MB	4MB	7MB-16MB
Number of files that can be open at once	9	Limited by memory	9	9	8	9

Command Strategy

Mouse support	■	■	■	■	■	■
Formatting uses codes inserted in file	□	□	□	□	■	■
Formatting uses paint-and-format method	■	■	■	■	■	■
Menu-driven interface available	■	■	■	■	■	N/A [†]
Ctrl-function key interface available	■	■	■	■	■	■
Command line available	□	□	■	■	■	□

Screen Display

Ruler	■	■	■	■	■	□
Ruler can be suppressed	■	■	■	■	■	N/A [†]
Margins/tabs adjustable on ruler	■ ■	■ ■	■ ■	■ ■	■ ■	N/A [†]
Format "ribbon" for choosing font and text attributes	■	■	■	■	■	■
Page breaks are shown while user is typing	■	■	■	■	■	■
Paragraph markers can be displayed or hidden	■	■	■	■	■	■
Long text lines can wrap to fit in editing screen	■	■	■	■	■	■
Graphics preview screen	■	■	■	■	■	■
Editable WYSIWYG view	■	■	□	■	■	■
Adjustable zoom levels	■	■	■	■	■	■
Draft mode	■	■	■	■	■	■

Text and Page Layout Features

Stylesheets	■	■	■	■	■	■
Format changes automatically when new stylesheet is applied	□	■	■	■	■	■
Choice of continuous or broken underline	■	■	□	□	□	■
Small capitals	■	■	■	■	□	■
Line spacing automatically adjusts to font height	■	■	■	■	■	■
Adjustable letter spacing (kerning)	■	■	□	■	□	■
Nonprinting comments or hidden text	■	■	■	■	■	■
Comments automatically converted to text and vice versa	□	□	■	■	□	■
Paragraphs can be kept together	■	■	■	■	■	■
Automatic vertical centering	■	■	□	■	■	■
Widow and orphan control	■	■	■	■	■	■
Indents entire paragraph without changing margin settings	■	■	■	■	■	■
Conditional page breaks	■	■	□	■	■	■
Snaking (newspaper) columns	■	■	■	■	■	■

N/A[†]—Not applicable. The product does not have this feature.

CONTINUES



WordPerfect for OS/2	WordPerfect for Windows	XyWrite
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\$495	\$495	\$348
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■	■	■
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\$495	\$495	\$295
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OS/2	Windows	DOS
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□	□	■
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7MB-16MB	4MB-15MB	7.5MB
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N/A †	N/A †	■
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can choose symbols from a graphics menu. Extensive printer support includes new high-volume models with output "joggers" for separating print jobs, and you can fax directly from the print menu. You can record and play back sound clips with all standard sound cards, including Microsoft Windows Sound System. Hidden text and comments features let you customize and annotate files.

Control over page layout is improved over that of earlier versions, with full-paragraph formatting, linked styles, and other features that match those of the best Windows word processors. But the package retains unique layout features such as absolute positioning, which keeps items in the same relative place on a page without forcing the use of frames for placement. A delay code feature lets you switch on features for any specified number of pages. Columns—the package now supports equal-length columns and footnotes under columns—are set up from a menu; you can't set widths with the mouse. Graphics import, border and box creation, and gradient fills are straightforward, as are drag-and-drop and resizing. Text automatically wraps around the irregular contours of a graphic. The equation editor is powerful but uses awkward codes rather than direct graphics editing.

FACT FILE

WordPerfect 6.0 for DOS

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; 800-451-5151, 801-225-5000; fax, 801-222-5077



List price: \$495; upgrade \$129

Requires: DOS 3.1 or later, 480K RAM (520K recommended) 7MB hard disk space (16MB for full installation)

In short: WordPerfect 6.0 for DOS, the most powerful application ever written for DOS, is a full-fledged WYSIWYG word processor with better font support than Microsoft Windows 3.1, an integrated spreadsheet, and superb formatting, document management, and printing features. Built-in fax and sound support add to its powers. If you have the hardware needed, it's the cleanest and most logical upgrade path from WordPerfect 5.1

446 ON-READER SERVICE CARD

SUITABILITY TO TASK

WordPerfect for DOS

	POWER	EASE
Letter	Good	Good
Business report	Excellent	Good
Newsletter	Excellent	Good
Long technical document	Excellent	Good

Styles are now deeply integrated in the program and supply the building blocks for collapsible outlining, flexible paragraph numbering, and graphics boxes and lines. In addition to paragraph styles, WordPerfect for DOS supports character styles and open styles—a more flexible system than any available elsewhere. But WordPerfect for DOS offers only limited counterparts to Microsoft Word for Windows' templates, which automatically store menus, macros, and layouts with predefined formats.

WordPerfect for DOS's support for large documents and merges remains strong. The master document feature, more logical than any similar feature in the competition, lets you combine multiple chapters for indexing and formatting, and support for legal footnoting is especially strong. Hypertext links are confusing to create but let you jump instantly within a file or to other files. A bookmark feature aids navigation and indexing but suffers from a weak implementation compared with rival programs: If you create a large bookmark that covers a smaller one, the smaller one disappears.

Merges offer much of the automated hand-holding you get in Ami Pro and WinWord, and records can be selected manually before merging. A menu that lets you assign names to merge fields comes up empty when you return to it to add or rename a field, and you have to modify the field names by hand in the data file. The automated envelope feature can print matching envelopes after printing merge documents.

File management includes two major conveniences: the QuickList feature, which lets you jump to lists of related files by selecting a descriptive name, and the QuickFinder feature, which lets you use Boolean searches for quick access to files that you previously indexed. Both were



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AMBRA systems with rock-solid one-year warranties. You can count on expert technicians nationwide to deliver onsite service within two days of your call, Monday through Saturday.¹ You can also rely on a toll-free support line for answers any time you need them — technical representatives are standing by to assist you 24 hours a day, every day.

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Processor ☐ 486SLC2, 50 MHz ☐ 486SX, 25 MHz
☐ 486DX, 33 MHz

Memory ☐ 4MB ☐ 8MB ☐ 16MB ☐ Other ___ MB

Hard disk ☐ 120MB ☐ 170MB ☐ 240MB ☐ 340MB

DESKTOP (5x5)

Processor ☐ 486 Blue Lightning, 66 MHz
☐ 486DX2, 66 MHz

Memory ☐ 4MB ☐ 8MB ☐ 16MB ☐ 32MB ☐ 64MB

Hard disk ☐ 170MB ☐ 240MB ☐ 340MB ☐ 440MB

MINITOWER (8x6)

Processor ☐ 486 Blue Lightning, 66 MHz
☐ 486DX2, 66 MHz

Memory ☐ 4MB ☐ 8MB ☐ 16MB ☐ 32MB ☐ 64MB

Hard disk ☐ 170MB ☐ 240MB ☐ 340MB ☐ 440MB

EISA DESKTOP (8x6)

Processor ☐ 486DX2, 66 MHz ☐ Pentium, 60 MHz

Memory ☐ 8MB ☐ 16MB ☐ 32MB ☐ 64MB

Hard disk ☐ 170MB ☐ 240MB ☐ 340MB
☐ 440MB ☐ 540MB SCSI-2*

EISA TOWER (8x12)

Processor ☐ 486DX2, 66 MHz ☐ Pentium, 60 MHz

Memory ☐ 8MB ☐ 16MB ☐ 32MB ☐ 64MB
☐ Other ___ MB

Hard disk ☐ 170MB ☐ 240MB ☐ 340MB
☐ 440MB ☐ 540MB SCSI-2

MONITORS

14-inch ☐ VGA color ☐ SVGA color
☐ UVGA color

15-inch ☐ AMBRA Flat Square Tube
☐ NEC Multisync 4FGE

17-inch ☐ AMBRA Flat Square Tube
☐ NEC Multisync 5FG

21-inch ☐ NEC Multisync 6FG

OPTIONS

CD-ROM ☐ Internal drive and software
☐ Multimedia Kit

Modems ☐ Data/Fax internal ☐ 2400 bps internal

Tape backup drive ☐ 120MB internal/external
☐ 250MB internal/external

Graphics accelerator ☐ ATI Ultra Pro Graphics VL

Printers & scanners ☐ IBM Personal Printer II (24-pin)
☐ IBM LaserPrinter 4039 (12 ppm)
☐ IBM LaserPrinter 4029 (10 ppm, 6 ppm)
☐ Calera WS Complete PC Scanner

SOFTWARE

Word processing ☐ Lotus Ami Pro ☐ Microsoft Word®
☐ WordPerfect

Accounting ☐ Quicken

Spreadsheet ☐ Microsoft Excel® ☐ Lotus 1-2-3
☐ Quattro Pro

Graphics/presentation ☐ Lotus Freelance Graphics
☐ Microsoft PowerPoint®

Comm/fax ☐ WinFax Pro

*Not available with 486DX2, 66 MHz processor.

Customized computers at uncommonly smart prices.



Slimline SuperSavers

- 486SLC2, 50 MHz
- 4MB RAM max: 16MB
- 64KB processor cache
- 3.5" 1.44MB diskette drive
- 120MB (19ms) hard disk
- 3 16-bit ISA slots
- Windows™ accelerator with 1MB video memory
- 14" VGA Color Monitor
- Slimline casing (3 x 3)
- MS-DOS® 6.0, Windows 3.1, mouse

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- 486DX, 33 MHz
- 4MB RAM max: 36MB
- 128KB processor cache
- 3.5" 1.44MB diskette drive
- 170MB (17ms) hard disk
- 2 VESA local bus slots
- Windows™ accelerator with 1MB video memory
- 14" SVGA LR Color Monitor
- MS-DOS 6.0, Windows 3.1, mouse

\$ 1,539



Do-More Desktop

- 486 Blue Lightning, 66 MHz
- Upgradeable to Pentium technology
- 8MB RAM max: 64MB
- 256KB processor cache
- 3.5" 1.44MB diskette drive
- 240MB (15ms) hard disk
- Onboard SCSI
- 5 16-bit ISA slots (2 VESA on local bus)
- Windows accelerator with 1MB video memory
- ★ 15" Flat Square LR color monitor, NI
- Network-ready (Ethernet 10BaseT)
- Desktop casing (5 x 5)
- MS-DOS 6.0, Windows 3.1, mouse

\$ 1,979

(For 8 x 6 minitower, add \$50)



Multimedia Minitower

- 486 Blue Lightning, 66 MHz
- Upgradeable to Pentium technology
- 8MB RAM max: 64MB
- 256KB processor cache
- 3.5" 1.44MB diskette drive
- 440MB (12ms) hard disk
- Onboard SCSI
- 8 16-bit ISA slots (2 VESA on local bus)
- Windows accelerator with 1MB video memory
- CD-ROM drive
- Media Vision 16-bit sound card
- Stereo speakers
- ★ 15" Flat Square LR color monitor, NI
- Network-ready (Ethernet 10BaseT)
- Minitower casing (8 x 6)
- MS-DOS 6.0, Windows 3.1, mouse

\$ 2,549



Pentium Processing Powerhouse

- Intel Pentium processor, 60 MHz
- 64-bit processor complex
- 8MB RAM max: 64MB
- 256KB processor cache
- 3.5" 1.44MB diskette drive
- 540MB SCSI hard disk
- Onboard dual-channel fast SCSI
- 8 32-bit EISA slots (2 VESA on local bus)
- ATI Ultra Pro Mach 32, 2MB VRAM
- ★ 15" Flat Square LR color monitor, NI
- Desktop casing (8 x 6; convertible to minitower)
- MS-DOS 6.0, Windows 3.1, mouse

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² Return shipping and insurance charges are the responsibility of the customer.

³ Offerings may differ in Canada.

► SUMMARY OF FEATURES

	 Ami Pro	DeScribe Word Processor for OS/2	Microsoft Word for DOS	 Microsoft Word for Windows	Q&A Write	 WordPerfect for DOS
Text and Page Layout Features (continued)						
Parallel columns	■	■	■	■	■	■
Extending across page	■	■	■	□	■	■
Maximum number of columns	8	20	20	100	8	24
Unmatched column widths available	■	■	■	■	□	■
Define columns on ruler and with cursor	■	■	□	■	□	□
Expandable box around text	■	■	■	■	■	■
Text Entry and Editing Features						
Number of undelete levels	4	Unlimited	1	1	1	3
Search and-replace						
Uses wildcards in search	■	■	■	■	■	■
Performs case-sensitive searches	■	■	■	■	■	■
Recognizes whole words	■	■	■	■	■	■
Searches and replaces format settings/ text attributes/fonts	■ ■ □	□ □ □	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Support for characters not in standard character set	■	□	■	■	■	■
Keyboard shortcuts for nonkeyboard characters	□	■	□	■	□	■
Hyphenation and Grammar Features						
Spell checker						
Number of words in standard dictionary	125,000	80,000	125,000	130,000	110,000	115,000
Number of user dictionaries available	1	3	1	4	2	12
Spell-checks as you type	□	■ (via macros)	□	□	□	□
Spell-checks single word	■	■	■	■	■	■
Spell-checks defined block	■	■	■	■	■	■
Hyphenation						
Hyphenates on the fly	■	■	■	■	■	■
Hyphenates using algorithms	■	■	■	■	■	■
Hyphenates using dictionary	□	■	□	■	■	■
Soft hyphens can be entered from keyboard	■	□	■	■	■	■
Thesaurus included	■	■	■	■	■	■
Integrated grammar checker	■	□	■	■	□	■
Tables and Numeric Features						
Interactive table editor	■	■	■	■	■	■
Table row can cross page breaks	■	□	□	□	□	□
User can put graphics in table cells	■	■	■	■	□	■
Dynamic table functions	■	□	□	■	■	■
Math in document	■	□	■	■	■	■
Keyboard calculations	□	□	□	■	□	■
Graphics Features						
Line drawing using cursor or mouse	■	■	■	■	□	■
Lines inserted via menus	■	■	■	■	■	■
Equation editor with graphics display	■	□	□	■	□	■
Graphics formats imported						
BMP	■	■	■	■	■	■
CDL	□	□	□	□	□	□
CGM	■	■	□	■	□	■

CONTINUES



first implemented in WordPerfect for Windows.

The spell-checker flags capitalization errors and can use multiple dictionaries in a single spell-check. It also supports a document-dictionary feature that stores rarely used words in the document that uses them. You can load Grammatik from the editing screen, but the grammar checker is only loosely integrated.

MORE THAN INTEGRATION

WordPerfect for DOS imports and exports most major word processing formats and can create links to spreadsheets. But you may not need your old spreadsheet—unless you need charting or high-end analytical functions—because WordPerfect for DOS has a miniversion of PlanPerfect built in. And an ingenious function similar to Windows' DDE (Dynamic Data Exchange) lets you automatically reproduce the data from a table cell anywhere else in your text.

The new version's file format can't be read by Versions 5.x of WordPerfect for DOS, WordPerfect for OS/2, or WordPerfect for Windows, but you can save files in 5.x format if you're willing to discard the newest features. A supplied converter translates some 5.1 macros to 6.0's new macro language, but many converted macros need editing, and 5.1 keyboard layouts must be recreated by hand. A separate macro manual is expected by the time you read this; the main manual barely mentions macros and is overly brief on most other subjects, and the help system is surprisingly clumsy. Network installation is highly automated, and any workstation's setup options can become the network default. Version 6.0a, an upgrade with enhanced speed and editing capabilities, became available too late for this review.

To use the package's graphics screen, you'll need the same CPU speed, disk space, and RAM that you need to run Windows, and even basic text editing needs a 386-or-better processor for tolerable speed. But this version gives you the graphics features you expect from Windows in the undistracting and familiar environment of DOS. All in all, the new version is a stunning success, with flexibility, power, and ease of use that only a few years ago were unimaginable in DOS programs.

WordPerfect Corp.

WordPerfect for OS/2

WordPerfect for Windows

BY EDWARD MENDELSON

WordPerfect 5.2 for OS/2 and WordPerfect 5.2 for Windows represent heroic and largely successful attempts to let users work in graphics environments with file formats originally designed for character-mode word processing.

Both of WordPerfect Corp.'s GUI-based word processors (\$495 each) use the same file format as WordPerfect 5.1 for DOS, and neither offers the advanced graphics capabilities of its peers, which include Versions 6.0 of WordPerfect for DOS and WordPerfect for Windows. But

SUITABILITY TO TASK

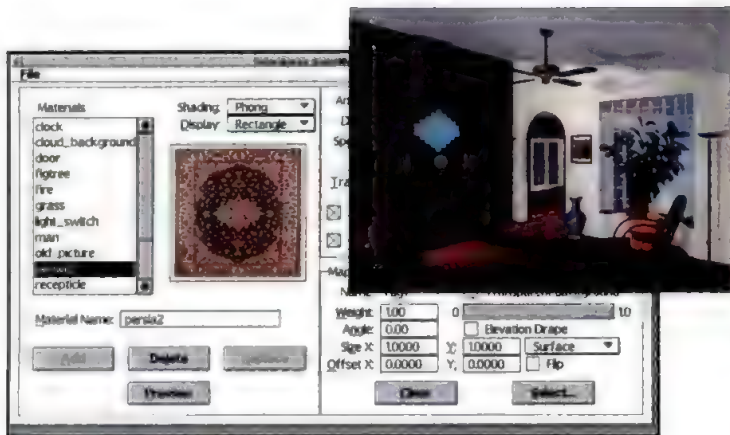
WordPerfect for OS/2

	POWER	EASE
Letter	Good	Good
Business report	Excellent	Good
Newsletter	Excellent	Excellent
Long technical document	Excellent	Excellent

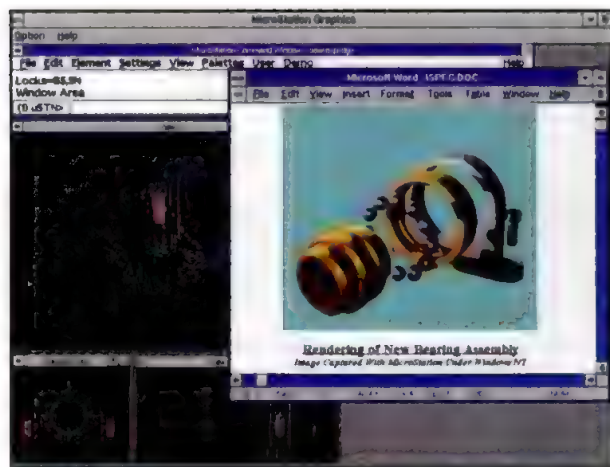
Versions 5.2 of WordPerfect for Windows and WordPerfect for OS/2 have document-management features that its peers can't match. The OS/2 version takes better advantage of its environment than any other program on the market and, with Express Docs, the Windows version makes letter creation much easier.

Both versions use almost the same menus, screen display, and keyboard layout, and both come with thorough manuals and help screens. They both support all the features of WordPerfect 5.1 for DOS except for in-document math, but make up for the omission with a table feature that includes math functions.

Both versions let you open nine files at once and view them in WYSIWYG (or draft) modes, but they only show the full page in an uneditable print preview that uses generic fonts instead of the fonts that actually print. Users have the option of viewing a customizable button bar and an ungainly formatting ruler that gives quick access to styles, fonts, and the table editor. As in other GUI packages, you can drag

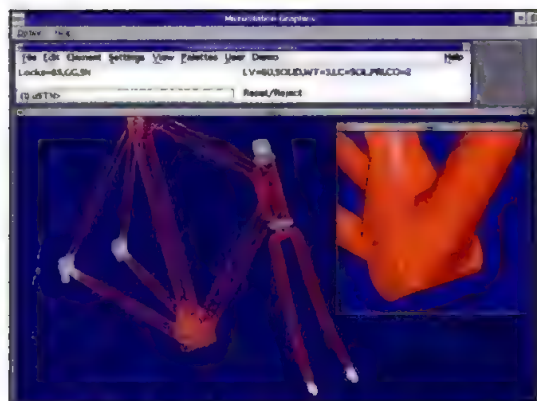


Rendering. Visualization and flythroughs – at your fingertips! MicroStation offers photo-realistic rendering to every designer, right in the software. It's easy to make your image reflect your imagination.



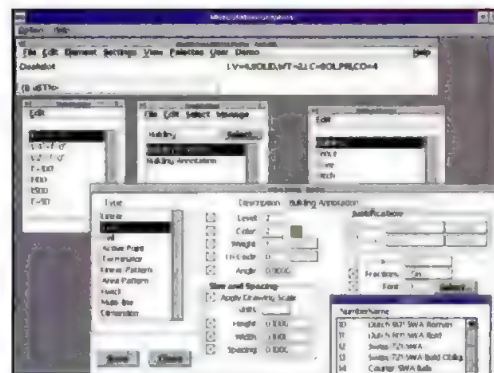
Windows. It walks and talks Windows. Behind MicroStation lies the user-responsive programming you look for in good Windows software. Version 5 gives you the ultimate in integration of CAD, engineering, and business applications.

MORE POWER TO YOU.



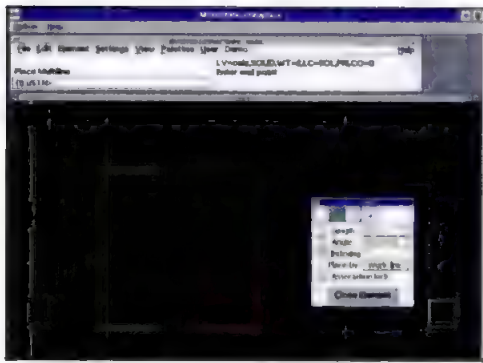
Modeling. Model any surface you can imagine in MicroStation. NURBS surface modeling combined with 3D Boolean operations gives you astounding flexibility in creating and modifying freeform models.

Read & write
AutoCAD .dwg



Workspaces. Choose the design environment that matches your profession or your CAD expertise – even AutoCAD. Complete with custom interfaces, drafting styles, and design environment management. CAD has never been so streamlined!

Drafting. MicroStation gives you first-rate drafting power – without the limitations of old technology. Enjoy the advantages of contemporary features like associative patterning/batching, plot preview, standard text editing and fonts, and context-sensitive Hypertext help.



Usability. What does computer-aided drafting have to do with the way you think? Everything. MicroStation software works for you. It understands the drafting process so well that it infers what you'll do next.



Graphical User Interface. MicroStation's easy-

to-use interface includes pull-down menus, dialog boxes, tear-off tool palettes, and tool settings window. Choose your interface –

Windows or Motif – on any platform. **Transparent Modeless Operation.** The software supports the way you naturally work, maintain-

Power. Take your pick of popular environments: DOS, Mac, Windows, Windows NT, or UNIX. Have a look at MicroStation on Intergraph's Technical Desktop Series personal workstations.

ing command execution while you fine tune: change element attributes or command parameters, manipulate views, change the dimensioning system, and more.

Powerful View Manipulation. MicroStation supports up to eight active views that can be moved, sized, and overlapped to fit your design. Zoom and area at any scale. Move around your design fast with built-in dynamic panning.

Workspace Editor. Tailor pull-down menus, dialog boxes, and tool palettes – even disable commands – with a graphically oriented toolset for customizing your chosen interface. **Text Capabilities.** A convenient text editor lets you easily edit single-

line or paragraph text. Choose from TrueType, PostScript, AutoCAD SHX, and MicroStation fonts. ASCII text files can be imported and exported. **Multiple**

Undo/Redo Commands. Undo mistakes and perform “what-if” designs in a flash with unlimited undo and redo. **Plotting.** Plot raster and vec-

tor information by view or defined areas, at any scale. Visually preview the plot before

plotting, saving time and materials. **Online HELP.** MicroStation's

HELP remains active, tracking the command you're currently using,

so there's no searching through manuals for assistance.

Associative Patterning and Hatching.

Associate patterning with graphics. Change graphics and the patterning updates. Flood-fill hatching/patterning

intelligently fills an area, detecting boundaries and holes with a single pick. **Associative**

Dimensioning. Dimensions are associated

with the geometry, not with a point in space, so that when you change the

geometry, the dimensions automatically update. **Custom Line Styles.** Create

space-saving custom line styles and place railroad tracks, trees, isobars – anything – just as you would place a line.

Multi-lines. Define line string elements comprising up to 16 parallel lines of varying symbology and store them in a style library for

all. Architects can use multi-lines for fast and easy placement and intersection cleanup of walls and partitions. **2D Boolean**

Operations. Quickly modify, measure, and hatch multiple 2D shapes with integrated Boolean operations. **Mass Properties.** Calculate area and

es of your model: surface area, volume, mass, centroid, moments and products of inertia, principal moments and directions, and radii of gyration

S. Define relationships among graphic entities with intuitive drawing modes such as tangent, parallel, perpendicular, midpoint, intersection, and en

Dimension-driven Symbols. Based on established relationships, you can assign variables to dimensioned graphics and save the graphics as c

ic placement. Changes in dimensions automatically drive changes to graphics. Dimension-driven design saves valuable time in the design of familie

MicroStation Version 5 puts you in charge.

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MicroStation

INTERGRAPH

Solutions for the Technical Desktop™

CIRCLE 048 ON READER SERVICE CARD

► SUMMARY OF FEATURES

Products listed in alphabetical order

■ = YES □ = NO

PC MAGAZINE
EDITORS' CHOICE

PC MAGAZINE
EDITORS' CHOICE

PC MAGAZINE
EDITORS' CHOICE

Ami Pro

DeScribe
Word Processor
for OS/2

Microsoft Word
for DOS

Microsoft Word
for Windows

Q&A Write

WordPerfect
for DOS

Graphics Features (continued)

.DRW	□	■	□	■	□	■
.EPS	■	■	■	■	□	■
HPGL	■	■	■	■	■	■
.MSP	□	■	■	■	■	■
.PCX	■	■	■	■	■	■
.PIC	■	■	■	■	■	■
TIFF	■	■	■	■	■	■
.WMF	■	■	■	■	■	■
.WPG	■	■	□	■	■	■
User can resize imported graphics with mouse	■	■	□	■	■	■
Text flows around graphics	■	■	■	■	■	■
Drawing tools included	■	■	□	■	□	□
Graphics can be inserted in text flow	■	■	□	■	■	■

Complex Document Creation

Customizable paragraph and outline numbering	■	■	■	■	■	■
Collapsible outlines	■	■	■	■	■	■
Automatic tables of contents	■	■	■	■	□	■
Multiple-level tables of contents	■	■	■	■	N/A [†]	■
Indexing	■	■	■	■	□	■
Multiple-level indexing	■	■	■	■	N/A [†]	■
Auto-numbered footnotes/endnotes	■ ■	□ ■	■ ■	■ ■	■ ■	■ ■
Cross-referencing	■	□	■	■	□	■
Master documents	■	■	■	■	□	■
Spreadsheet links	■	■	■	■	■	■
Text-file links	■	■	■	■	■	■
Client/server DDE support	■ ■	■ ■	N/A [‡]	■ ■	■ □	N/A [‡]
Client/server OLE support	■ ■	N/A [‡]	N/A [‡]	■ ■	■ □	N/A [‡]

Printing Features

Printer support	All Windows printers	All OS/2 printers	500 printers	All Windows printers	All Windows printers	900 printers
Background printing	■	■	□	■	■	■
Print queue	■	■	■	■	■	■
Print queue can be modified	■	■	□	■	■	■
Prints defined block	□	□	■	■	□	■
Prints discontinuous range of pages	□	□	■	□	□	■
Prints current page	■	■	□	■	□	■
Automatic envelope formatting and printing	■	□	□	■	■	■
Landscape and portrait pages printed in same print job	■	□	■	■	□	■
Collates print job	■	■	□	□	■	■

File Management and Import/Export Features

Timed backup	■	■	■	■	■	■
File manager included	■	■	■	■	□	■
Can print files from file-manager list	□	■	■	■	■	■

N/A[†]—Not applicable. The product does not have this feature. N/A[‡]—Not applicable. The package's operating system does not support this feature.

CONTINUES



WordPerfect
for OS/2

WordPerfect for Windows

XyWrite

☐	☐	☐
☒	☒	☐
☒	☒	☐
☒	☒	☒
☒	☒	☒
☒	☒	☒
☒	☒	☒
☒	☒	☒
☒	☒	☒
☒	☒	☐
☒	☒	☒
☐	☐	☐
☒	☒	☒

		N/A [†]
N/A [†]		N/A [†]

All OS/2 printers, drivers	900 printers	All Windows 1,200 other printers, 200 other drivers
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	□
■	■	■
□	□	■
■	■	■
■	■	■
■	■	■

and resize graphics and modify tabs, columns, and margins on a ruler, but when you edit headers, footers, or even the caption to a graphic, the main text of your document disappears, and you have to work in a separate editing window that takes over the screen.

Unlike WordPerfect 6.0 and rival GUI word processors, WordPerfect 5.2 packages generally won't let you select a region of text and apply the format you choose. They instead make you insert separate codes at the start and end of the region. They are smart enough to insert the codes at the exact point where they belong, but other packages let you format text more intuitively. You can build complex pages with columns and imported graphics, but you can't create images inside the programs, and the equation editor makes you select codes before you can view your equation. The master document feature provides unparalleled control over long documents, but you can't collapse outlines.

FACT FILE

WordPerfect 5.2 for OS/2

WordPerfect 5.2 for Windows

**WordPerfect Corp., 1555 N. Technology
Way, Orem, UT 84057; 800-451-5151
801-225-5000; fax 801-222-5077**



List price: \$495, upgrade \$129

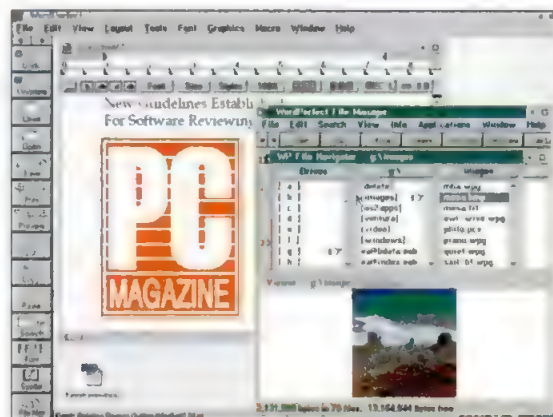
Requires: WordPerfect for OS/2 8MB RAM, 45MB hard disk space (16MB for full installation), OS/2 2.0 or later WordPerfect for Windows 4MB RAM, 7MB hard disk space (15MB for full installa-

tion). Microsoft Windows 3.0 or later

In short: WordPerfect 5.2 for Windows offers powerful file management features and full compatibility with WordPerfect 5.1 for DOS, but it's slower and generally more awkward than rival Windows packages. Despite similar limitations, WordPerfect 5.2 for OS/2 offers exceptionally tight integration into the OS/2 Workplace Shell and is the first OS/2 word processor with the full powers offered by the best DOS and Windows applications.



C.N. READER SERVICE CARD



WordPerfect 5.2 for OS/2 comes with a native OS/2 file manager and viewer that can be run from WordPerfect's menus.

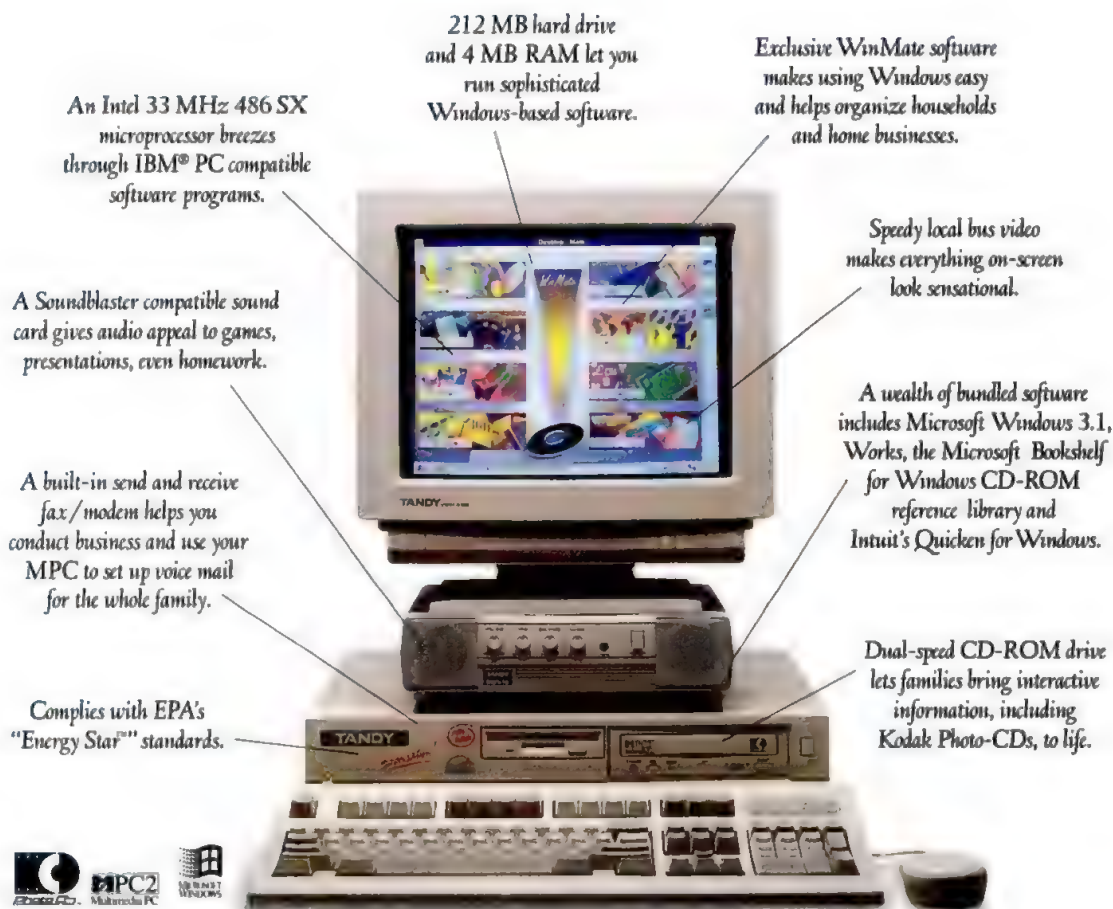
PRINT PERFECT

Both versions allows you to print with either WordPerfect's powerful printer drivers or the printer drivers written for the operating environment. All of the printer drivers let you use the 1,500 symbols in the WordPerfect character set. The macro language of each program is incompatible with that of WordPerfect 5.1 for DOS, although it's roughly similar to the new macro language that you'll find in WordPerfect 6.0 packages. Both programs let you record a macro that opens a menu for user input—in contrast with GUI word processors from all other vendors, which require you to learn a programming language to perform this seemingly elementary task.

The advanced file-management tools in each package include the QuickFinder index utility, which makes compact indexes of massive amounts of data and lets you search the index from within WordPerfect. Both packages also include a file manager that you can run separately from the word processor and an ingenious QuickList feature that not only lets you give descriptive names to different directories or file specifications but also displays a list of matching files when you click on any of the names. Other programs assume that you keep your files in only one directory.

The Grammatik grammar checker is loosely linked to the Windows version and is more closely integrated in the OS/2 version, where your file stays active while you run the checker. Each package includes the same character-based DOS utilities used by Word-

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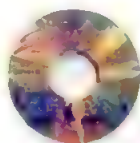
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► SUMMARY OF FEATURES

Products listed in alphabetical order

■ = YES □ = NO



	Ami Pro	DeScribe Word Processor for OS/2	Microsoft Word for DOS	Microsoft Word for Windows	O&A Write	WordPerfect for DOS
File Management and Import/Export Features (continued)						
Document descriptions	■	■	■	■	□	■
Searches disk for filenames/text in files	□ □	□ □	■ ■	■ ■	□ □	■ ■
User can view files before opening	□	■	□	■	□	■
Automatically senses import file format	□	■	■	■	■	■
Translates ASCII files with CR/LF at end of each line into formatted paragraphs	■	■	□	■	□	■
File import/export formats:						
Ami Pro	■ ■	■ ■	□ □	■ □	□ □	■ ■
Microsoft Word for DOS	■ ■	■ ■	■ ■	■ ■	□ □	■ ■
Microsoft Word for Windows	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
RTF	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
WordPerfect	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
WordStar	■ ■	■ ■	■ ■	■ ■	□ □	■ ■
Macros						
Recorded keystroke macros	■	■	■	■	N/A †	■
Programmable macros	■	■	■	■	N/A †	■
Remappable keyboard	■	■	■	■	■	■
Glossary	■	■	■	■	□	■
Corporate and Professional Features						
Mail-merge	■	■	■	■	■	■
Data import formats supported:						
dBASE	■	■	□	■	■	□
Lotus 1-2-3	■	■	■	■	□	■
Microsoft Excel	■	■	■	■	□	■
User can select field names from menu	■	■	■	■	■	■
Sorting function	■	■	■	■	■	■
User can select fields for sorting	■	■	■	■	■	■
Mailing labels printed	■	■	■	■	□	■
Preformatted forms processing	■	■	□	■	□	■
Revision marking (redlining) on the fly	■	□	■	■	□	□
File comparison	■	□	□	■	□	■
Group editing notes with users' initials	■	□	■	■	□	□
Password to prevent file modification	■	□	■	■	□	■
File encryption	□	□	□	■ (via library format)	□	■
Direct e-mail link	■	■	□	■	■	□
Help and Documentation						
On-line tutorial	■	■	■	■	■	■
Context-sensitive help	■	■	■	■	■	■
Adjustable help levels	□	□	□	■	□	□
On-line tutorial	■	□	■	■	□	■
Keyboard templates	□	□	■	■	□	■
Indexed reference manual	■	■	■	■	■	■
Free technical support	■	■	■	■	■	■
Toll-free number	□	□	□	□	■	■

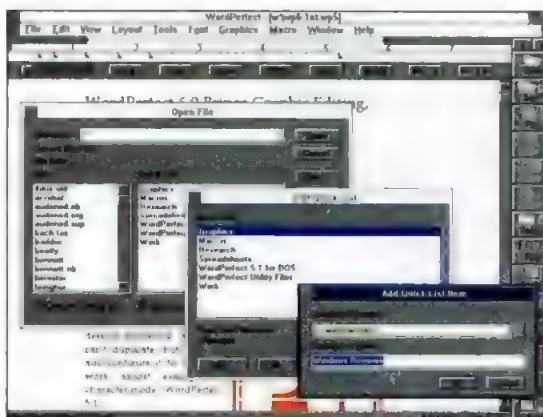
N/A †—Not applicable. The product does not have this feature.



WordPerfect for Windows

XyWrite

■	■	■
■ ■	■ ■	■ ■
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Perfect 5.1 for DOS to modify printer drivers and edit the spell-checker's wordlists.

The Windows version comes with an add-on package called Express Docs that provides 45 document templates, some of them equipped with macros that prompt you to fill in data. The OS/2 version comes with five simpler documents that install in the Workplace Shell as template objects.

The OS/2 version stands out for its close integration with the Workplace Shell. Even if the package isn't running, OS/2 detects any files created by Versions 5.x of WordPerfect for DOS or WordPerfect for Windows whenever you open a directory. It then registers them as WordPerfect document objects. The object's OS/2 Settings Notebooks and Detail Views listings then display fields like keyword and author from the document summaries created in WordPerfect. You can then use the contents of the fields to determine which objects will appear to the user and the order in which they will appear. The registration process is slow.

SUITABILITY TO TASK

WordPerfect for Windows

	POWER	EASE
Letter	Excellent	Good
Business report	Excellent	Good
Newsletter	Excellent	Excellent
Long technical document	Excellent	Excellent

The OS/2 version also lets you drag and drop WordPerfect files, graphics, and spreadsheets from the Workplace Shell to an editing window and insert them into a document. Both versions support DDE (Dynamic Data Exchange) links, and the Windows version can embed OLE (Object Linking and Embedding) objects.

Except for its file-management features, WordPerfect 5.2 for Windows is outclassed by rival Windows packages, but the impending Version 6.0 makes WordPerfect for Win-

downs an equal contender with Microsoft Word for Windows and Ami Pro. WordPerfect 5.2 for OS/2 won't be replaced by Version 6.0 until next year. The current version lacks the graphics panache of DeScribe Word Processor for OS/2, but despite its limitations, it is the only OS/2 word processor with the full range of features available in DOS and Windows programs—and the only OS/2 application that makes full use of the object-oriented powers of the Workplace Shell.

The Technology Group Inc.

XyWrite

BY LEONARD PRESBERG

XyWrite 4.0 (the product's first update in several years) builds on its command line character-mode ancestry by gaining a number of new features to bring it more in line with other vendor offerings. Previous versions of XyWrite built a solid if modest following based on the program's speed, compactness, customization capabilities, and prowess as a publishing front end. XyWrite 4.0 doesn't fit on a single disk, as did its predecessor, XyWrite III Plus (7.5MB of disk space is needed for a standard installment), but it's still the fastest and most customizable word processor known to mankind. And the new features do give it something approaching modernity.

Priced at \$495, XyWrite 4.0 is the first offering from The Technology Group.

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The image you see over there started out attached to the image you see over here. But as it made its way to the printer, the computer it was created on recognized a problem: 11 x 17 pages can't fit on

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can add 1- and 2-MB Programmable

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CIRCLE 062 ON READER SERVICE CARD

• The Next Battle of the Titans

WordPerfect 6.0 for Windows and Microsoft Word 6.0 for Windows

by Edward Mendelson

The Windows word processing market will soon experience the biggest upheaval since the first versions of Ami Pro and Microsoft Word for Windows brought graphical word processing to the PC. New versions of WinWord and WordPerfect for Windows, both numbered 6.0, will bring Windows word processing to a level of automated convenience unimaginable a few years ago. And one of the last DOS holdouts, XyWrite, is adding to the Windows arena with a version of its own.

THE RIVALS

Rival word processors tend to copy each others' best features in each new version. In their latest incarnations, WinWord and WordPerfect for Windows join Ami Pro by offering customizable floating toolbars and the ability to edit footnotes, headers, and other text features in page view. Both advance on Ami Pro by offering editable multipage views; WordPerfect for Windows lets you edit facing pages on the same screen, while WinWord lets you work with anywhere from 2 to 40 pages at once.

Both programs offer automated bullets and numbering, "watermarks"

that print behind text, formatting menus with miniature preview screens, integrated grammar checking, mail-merge menus, graphics that can include text on a curve, templates with customized menus and macros, and the ability to open multiple files simultaneously. But both of these powerful packages also offer notably different feature sets. If you need functions offered by one, you probably won't be satisfied with the other.

MICROSOFT WORD 6.0 FOR WINDOWS

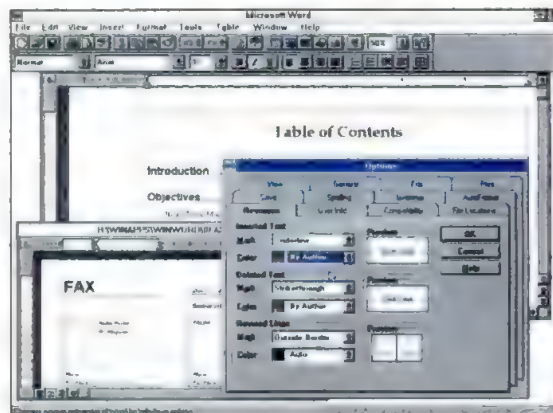
The latest version of WinWord shines with dazzling automation and ease of use. You can use predesigned layouts generated by its "wizards" by setting preferences from a series of menus.

You can automatically format a text file according to a stylesheet. Instead of laboriously assigning a format for each paragraph (as was necessary in Version 2.0) you now choose auto-format, let the program identify headlines and text, and then apply formats suitable to each.

No other package automates as many features as WinWord. If you choose, the program can change uninteresting vertical quotation marks to typographic quotation marks on the fly, and—taking a cue from XyWrite—it corrects misspellings and expands abbreviations as you type.

OLE 2.0 support lets you edit Microsoft Excel spreadsheets in WinWord's editing window. Furthermore, OLE-enabled graphics modules let you draw arrows to keywords in your text or circle words

that call for special attention. Then the program automatically creates small text boxes with lines that point to specified text in the main document. You can select from a variety of precooked table



WinWord 6.0 includes the easiest-to-use option menus available, with tabs for easy access to major features.

formats, just as you choose among templates when entering text. Special symbols can be inserted from an informative, descriptive menus—although you don't get the enormous range of symbols accessible in WordPerfect.

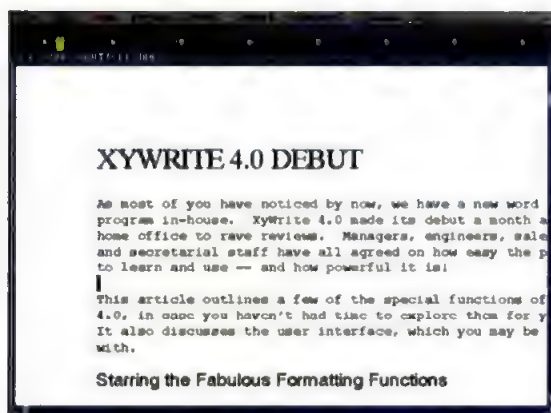
WinWord allows more flexible group editing than any other software. Revisions are marked automatically with time and initials, and the package can keep track of revisions invisibly, without marking the text on-screen until you decide to review the changes. Even when you're not marking revisions, a 100-level Undo command lets you reverse any recent editing decision.

The Spartan screen of Version 2.0 has flowered into multiple toolbars, information-packed borders and rulers, and an editing screen that grays out the rest of the page when you format a header. In the latter case, you always know exactly what you can and can't do—since you know what areas are inactive. Also, context-sensitive menus pop up anywhere you click, and a "tip-



WordPerfect 6.0 for Windows can apply sophisticated image controls to graphics.

181



XyWrite now offers a fully editable graphical WYSIWYG mode in addition to its character modes.

which acquired the original developer, Xyquest, last year. XyWrite was almost published by IBM Corp. under the name Signature, but at the last moment IBM dissolved its PC software division. XyQuest marketed this version of XyWrite under the name Signature. XyWrite 4.0 evolves from Signature, and not from XyWrite 3.x.

XyWrite is a code-based word processor, similar in some ways to WordPerfect. Unlike WordPerfect, XyWrite codes can be entered directly from the command line at any time and are completely editable through an expanded-view mode that displays codes as text strings. A touch of the F5 key takes you to the command line, where most commands are typed in as simple mnemonics, such as *RM* plus a number to set the right margin or *PG* to set a page break.

BIG CHANGES

The major enhancements in XyWrite 4.0 are a graphical view mode and the ability to toggle between the traditional command line-driven editing screen and a screen with CUA-compliant pull-down menus. While XyWrite III Plus did have menus (which constituted the "Plus"), they came as an extra installation option. And since they used the same basic structure as the famous but outmoded Lotus 1-2-3 and DOS menus, they won few hearts and minds. The new menus greatly enhance ease of use and even provide

shortcuts for some procedures like setting up envelopes, defining styles, and inserting tables of contents and indexes. Not all of XyWrite's hundreds of commands, however, are available from the menus.

XyWrite's fully editable WYSIWYG graphics mode lets you view text from 5 to 400 percent of normal size using Bit-Stream screen fonts. Unfortunately, this system is markedly harder to use and provides a considerably poorer display than the WYSIWYG displays provided by other word processing packages.

It is also significantly slower than the text mode in many operations, as you might expect. Stray marks and characters appear on the display frequently, and it is often difficult to set the Zoom level properly (in order to display the text in a readable size) without hiding too much of the page, whether you use the defaults or set your own levels.

Nonetheless, in text mode, XyWrite remains a contender for fastest kid on the block. The ability to work in text mode provides for ultra-fast data entry; there is no formatting or display work to slow you down. XyWrite especially proved itself in our Search-and-Replace and Spell-Check tests, where it maintains its greatest advantage.

NOT FOR THE FAINTHEARTED

XyWrite's programmability makes it perhaps the most customizable package

around, but its command (as opposed to feature) orientation can make some typical office tasks absurdly complicated. For example, to print a set of mailing labels, as we did in testing, you first

issue a Snake command to set up multiple columns; then you issue a Repeat Record command so each data set doesn't appear on a new page. You must manually place each field (name, address, and so on) in the document. You must also manually add carriage returns to make sure that you are filling up the whole label. This

FACT FILE

XyWrite 4.0

The Technology Group Inc., 36 South Charles St., Baltimore, Maryland 21201; 410-576-2040; fax, 410-576-1968

List price: \$495

Requires: 384K RAM, 2MB hard disk space, DOS 3.3 or higher

In short: XyWrite 4.0 adds menus and a graphical-view mode to a venerable command line-based product. Version 4.0



definitely deserves a look by current XyWrite users, as the new features bring it more in line with other vendor offerings. But XyWrite is not as polished as some other word processors and even with the new menus remains a hard program to learn.

486 ON-READER SERVICE CARD

compares poorly with similar procedures in word processors like Microsoft Word for Windows and WordPerfect for Windows, which essentially automate the entire process. No, XyWrite is *not* a general office word processor; it is a writer's and editor's word processor.

As such, XyWrite offers a number of nifty features, such as the ability to spell-check as you type, automatically replacing your common abbreviations as you go, and the ability to track modifications to a file based on a log-on name. If you're running on a network, XyWrite asks you for your name when you log on; if you then use the redlining feature for group editing, the program adds a nonprinting slug indicating the date of each change and identifying you as the author.

MORE TO COME

Current users of XyWrite should definitely look at upgrading to XyWrite 4.0 for DOS. Although it's probably not the word processor of choice for most office situations (as mentioned, it handles many basic office tasks awkwardly), current publishing operations based on XyWrite should appreciate the new menu structure and graphical view mode. Those working in the Windows environment should stay tuned for the forthcoming XyWrite for Windows—and see the sidebar, "The Next Battle of the Titans." □

SUITABILITY TO TASK

XyWrite

	POWER	EASE
Letter	Good	Fair
Business report	Poor	Poor
Newsletter	Good	Poor
Long technical document	Fair	Fair

PCI Local Bus *Has Arrived*

PCI technology, with the potential to break the PC data logjam, may redefine the PC bus. Superior performance, user friendliness, and a path for future upgrades make the PCI bus the bus of tomorrow.

by Dave Rowell

Add the letters "PCI" to the long list of acronyms in your personal computer vocabulary. These three innocent-looking letters may soon have a stunning impact on how fast your computer operates. The Peripheral Component Interconnect standard is the newest in local-bus technology and, after a long gestation period, has finally made its way into mainstream desktop personal computers. While high-speed video and hard-disk performance via VL-Bus or proprietary local-bus expansion slots have been available for a while, PCI raises the roof on data throughput to impressively high levels.

How high? PCI technology has the power to bring color-filled, high-resolution, full-motion video in multiple windows to your screen. It can provide add-in cards that configure themselves, and it offers top-notch hard-disk throughput. PCI's abilities and the way it works will have a profound impact on the shape of the

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History of the PC Expansion Bus



1981

The original IBM PC debuts with 8-bit, 4.77-MHz expansion slots. In 1984 this kind of bus is extended to a 16-bit, 6-MHz design now known as the ISA (Industry Standard Architecture) bus with the introduction of the IBM AT and its 16-bit 80286 processor. The ISA bus is later upgraded to 8-MHz. Despite numerous predictions of its imminent demise, the ISA bus remains the most popular and most compatible PC expansion bus.



1987

IBM introduces the 16- and 32-bit Micro Channel architecture (MCA) buses, which are incompatible with ISA peripherals but far more robust. In the same way that IBM's OS/2 is supposed to revolutionize operating-system software and retire DOS, the MCA design—a key feature in many of IBM's PS/2 PCs—is supposed to put ISA out to pasture. Of course, that has not happened.



1988

The 32-bit Extended Industry Standard Architecture (EISA) bus debuts as a PC-industry response to MCA. EISA slots retain the basic design of ISA slots but are made deeper to accommodate a second, lower row of contacts. ISA cards fit into EISA slots but are only deep enough to reach the first row of ISA-compatible contacts. EISA cards reach both rows of contacts. Thanks to the complexity and expense it adds to motherboards, EISA also fails to unseat ISA as the standard bus of choice.

PC industry for the near future.

Compared with the VL-Bus and other local buses, PCI offers higher performance, automatic configuration of peripheral cards, and superior compatibility. On the downside, it's likely to be expensive and to appear at first on high-end systems only, which will require the best and fastest video.

The wide acceptance of Microsoft Windows 3.1 and IBM's OS/2 2.1 has made local-bus expansion slots a must-have feature in PCs. Simply put, the amount of graphics data required by Windows and OS/2 applications has overwhelmed the data-throughput capacity of Industry Standard Architecture (ISA), Micro Channel architecture (MCA), and Extended Industry Standard Architecture (EISA) expansion buses.

To get around this data bottleneck, PC designers bypassed these standard expansion buses by hooking the graphics display control circuitry directly onto the 486 CPU's local bus.

Since the video circuitry and, often, the hard-disk controllers of local-bus PCs reside on the same signal lines the CPU uses to access DRAM memory, these peripherals can operate at the CPU's full clock speed over a 32-bit-wide data path. This translates into excellent performance with higher resolutions, more colors, and quicker screen-refresh rates, and it opens the PC to full-motion video, which usually overwhelms conventional bus technology.

With current local-bus systems, graphics performance is limited only by CPU

and graphics chip performance—not by the bus between them. Until recently, local bus meant either a proprietary system that was limited to a specific vendor or VL-Bus, a peripherals interface standard established last year by the Video Electronics Standards Association (VESA).

*Strictly speaking, PCI isn't
a true local bus at all but
a mezzanine bus.
The PCI bus is one step
removed from a system's
processor bus.*

Unfortunately, the VESA VL-Bus design philosophy was to keep costs and development time down by tapping directly into the 486 bus with as little added design baggage as possible. Today, PCI goes a step further with a technically more elegant solution to the problem of displaying more information faster.

PCI: PERFORMANCE FIRST

The need for speed is apparent. While personal computer processor performance has improved nearly a hundred-fold since the original IBM PC in 1981, I/O bus throughput has risen only five-fold, going from the PC's 8-bit 4.77-MHz bus to the AT's 16-bit 8-MHz bus. The

AT bus, now called the ISA bus, provides a maximum throughput between 4 megabytes per second and 8 MBps on most systems.

Advanced buses such as MCA and EISA provide improved data throughput—short bursts as fast as 33 MBps with EISA and potentially faster with some Micro Channel designs—along with other efficiencies such as bus mastering. But limited availability, design complexity, and high production costs have relegated these elegant solutions to servers and specialized systems.

First and foremost, PCI will mean an added performance boost for PCs without burdening the PC's processor. A PCI bus running at 33 MHz can move data at a peak rate of 132 MBps during data bursts. In practice, Intel Corp.'s PCI chip set can currently sustain throughput of 80 MBps for long data transfers—ten times an ISA system's capability. This fast, wide bus is exactly what is needed to feed a hungry multimedia application.

For instance, PCI can handle 24-bit true-color graphics at 30 frames per second, the minimum for full-motion video. It takes about 2.3 megabytes of data to draw each frame. At 30 frames per second, this adds up to nearly 70 MBps of full-motion video, which overwhelms conventional buses, resulting in jerky video as frames are randomly dropped. The PCI standard will not be limited to video, with peripheral-makers readying hard-disk controllers and networking cards that will further speed up PCs.

The present PCI specification is evolving from its original 32-bit bus to 64 bits, but 64-bit PCI systems and peripherals won't be available until next year. The

Our Contributors: DAVE ROWELL is a free-lance computer writer. ROBERT S. ANTHONY is a senior writer at *PC Magazine* and was in charge of this story.



Dell XPS series



NEC Image P60

1992

The VESA VL-Bus specification is announced by the Video Electronics Standards Association (VESA) as an attempt to end local-bus video chaos. Early 32-bit local-bus video controllers could only be used with a particular vendor's machines. The VL-Bus standard covers major design concerns but does not resolve all compatibility issues. The VL-Bus expansion slot is usually used in tandem with a standard ISA or EISA slot.

1993

The PCI bus finally turns up in PC hardware. Instead of actually residing on the CPU bus, the PCI bus fits neatly on a "mezzanine" level between the CPU bus and peripherals. The exacting nature of the PCI specification and of its ability to exploit the power of the Pentium processor gives it the potential to be the fastest and most compatible bus for mainstream PCs.

maximum data rate will double to 264 MBps, enough to handle HDTV (high-definition television) and real-time 3-D rendering. The PCI specification handles the 64-bit upgrade path very nicely: A 64-bit PCI expansion card works in a 32-bit slot and vice versa, even though the 64-bit slot is longer.

MEZZANINE SEATS

Strictly speaking, PCI isn't a true local bus at all but a *mezzanine* bus. The PCI bus is one step removed from a system's processor bus; it occupies an intermediate level between the processor bus and standard expansion buses such as ISA, EISA, or MCA, with electronic bridges spanning the gap.

In an ISA-PCI system, for example, the ISA control logic will be one of the PCI devices on the PCI bus (see the diagram). Like the PCI controller, the ISA expansion bus interface is called a bridge because it translates signals from one bus to another.

By isolating the PCI bus from the CPU's local bus, a PCI design can support more devices than a VL-Bus design because PCI devices don't electrically load down the CPU bus. Most VL-Bus systems support two or three local bus peripherals, adequate for current needs, but maybe not for the future. The PCI specification allows up to ten "loads" on the PCI bus, which can translate into as many as ten integrated devices, but fewer than ten expansion cards. A PCI rule of thumb conservatively counts two loads to one card. In addition, the PCI controller itself and any expansion bus bridge on the PCI bus each counts as one load.

A typical PCI system will provide

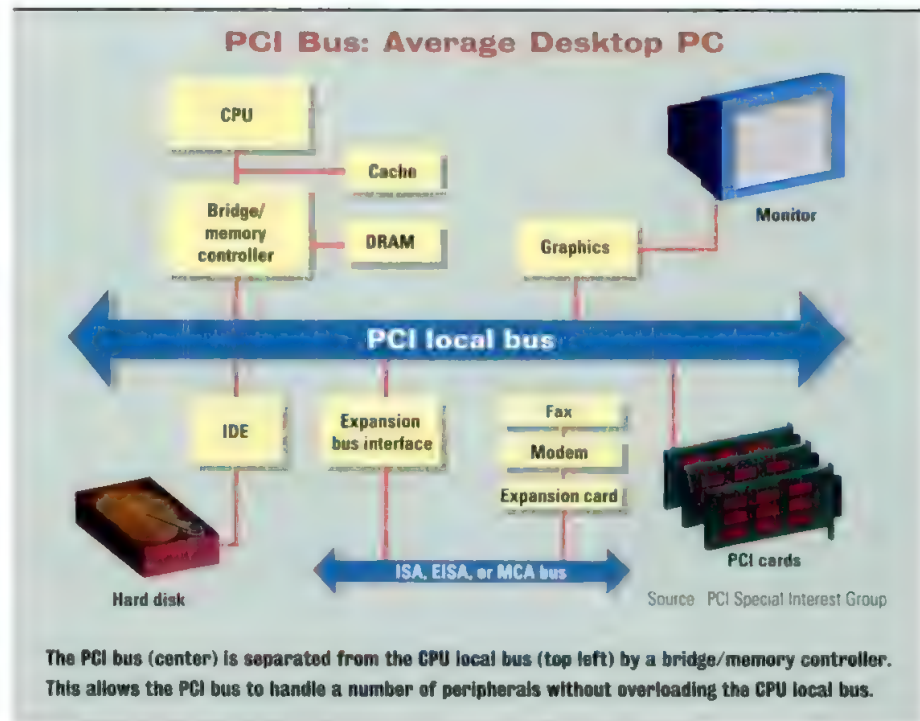
three slots plus up to two built-in devices such as a video controller or a SCSI-2 host adapter. Rules were made to be broken, however, and sophisticated system designers can ignore the rule of thumb and design for more PCI devices, as long as the bus still meets the PCI electrical specifications. While there is currently no need for so many PCI peripherals in most systems, PCs can still support multiple PCI buses, if the need arises in the future.

By contrast, the VL-Bus load limit varies with bus speed. The specification allows up to three expansion slots on a 33-MHz 486 local bus, but fewer devices at higher clock speeds where signal timing becomes more critical. System design-

ers exceeding these guidelines run the risk of distorting the signals on the local bus to the point of erratic operation. VL-Bus designs can buffer devices to provide bus isolation and thereby increase the number of supported devices, but buffering adds wait states and degrades performance.

If not properly implemented, isolating the processor from the PCI bus can create potential delays in any transaction between a CPU and devices on the PCI bus. Intel, which designed the PCI bus and has been its main proponent, has designed PCI chip sets to overcome this effect by clever use of read and write buffering at the bridge interface. (Other companies such as VLSI Technology, OPTi, and Silicon Integrated Systems Corp. have announced or are developing PCI chip sets.)

With Intel's chip set design, the CPU can now write data to a device and the PCI controller can then store the data immediately in its buffer, letting the CPU quickly go to the next operation rather than wait for completion of the transfer. The buffer then feeds the data to the PCI device in efficient bursts. If the CPU is writing a series of bytes to a device, the start of the transfer will be delayed, but there will be no delays between bytes



with traffic lights locked on green.

Buffering like this is optional, and it's likely to appear at first on high-performance systems and to cost extra compared with other local-bus designs. Other chip set manufacturers, like OPTi and VLSI, are promising similar methods of operation that they say will meet or exceed the level of PCI performance created by Intel.

PCI, PENTIUM, AND BEYOND

Generally speaking, the overall performance of the PCI and VL-Bus standards on 486 systems is about equal for both read and write operations. While most of the systems sold in 1994 will have 486 CPUs, it is in Pentium systems where the technical capabilities of PCI will overtake the VL-Bus.

First, the VL-Bus loses the advantage of a direct CPU connection because the VL-Bus is specifically a 486 bus. This means that system-board designers must buffer the VL-Bus, slowing down the system for Pentium. Also, Pentium local-bus speeds, at 60 MHz and 66 MHz, are too fast for more than one integrated VL-Bus peripheral. (The more typical design runs the VL-Bus at 33 MHz, which allows for more VL-Bus peripherals.) In addition, on a high-performance system running a true multitasking operating system such as OS/2, Windows NT, or Unix, PCI gains the upper hand in performance, thanks to its ability to work concurrently with the CPU. This allows the CPU and PCI bus to chug along simultaneously.

On current VL-Bus designs, however, the CPU can't operate independently when a VL-Bus device is active, potentially bogging down the processor. That also holds true on the VL-Bus Pentium systems introduced so far, though it doesn't have to be that way. Because the VL-Bus is essentially the 486 bus, it must run through a bridge on a Pentium system. Such a bridge could borrow a cue from PCI and be designed to allow CPU concurrency. At the same time, a new VL-Bus specification promises to make this bus war more interesting.

The VL-Bus will go 64-bit and be more effective on Pentium PCs (see the sidebar on the VL-Bus 2.0), but Pentium/VL-Bus chip sets that provide the bus performance of current Pentium/PCI

■ VL-Bus 2.0 and Future Prospects

Challenged by the arrival of PCI-compatible products, supporters of the VL-Bus did not roll over and play dead. By the time you read this, VESA's VL-Bus committee will have ratified VL-Bus 2.0, an updated local-bus specification.

VL-Bus 2.0 adds key features that make PCI suitable for Pentium systems. One is support for maintaining *cache coherency* when the CPU uses write-back caching, something the Intel 486 doesn't have but the Pentium does. (Cyrix has a 486 chip with internal write-back caching.) The VL-Bus 1.0 design reserved signal lines for cache coherency, but VL-Bus 2.0 actually implements it.

Like PCI, VL-Bus 2.0 adds support for 64-bit peripherals, a match for the Pentium's 64-bit data bus. Cleverly, 64-bit VL-Bus expansion cards have been designed to use the same connector as existing 32-bit VL-Bus cards by multiplexing the address lines to get 64 data lines. Also like PCI, the new VL-Bus specification provides for upward and downward compatibility between 32-bit and future 64-bit systems and expansion cards.

Though the VL-Bus is essentially an extension of the 486 local bus, VL-Bus specifications always allowed for the isolating of devices from the CPU local bus. Unfortunately, doing so has meant poorer performance and added expense.

chip sets won't arrive for a while, and buffering negates any cost advantage the VL-Bus had on 486 PCs.

Taking a step into the PC's future, PCI's bus isolation allows faster processor speeds. In theory, you could hook a PCI bus to a 100-MHz Pentium or a 200-MHz Alpha RISC processor, where a true local-bus connection to the CPU would be electronically out of the question. This processor independence is a boon from the system manufacturer's point of view, because it reduces development cost by allowing use of peripheral bus components with little redesign

To make the benefits of bus isolation feasible, including CPU concurrency and easy use with advanced CPUs such as Pentium, the VL-Bus 2.0 specification, for example, adds support for packaging data in bursts. As with PCI, a combination of buffering and bursting can essentially mask the delays coming from bus isolation.

To address criticism that the VL-Bus specification lacks "robustness," VL-Bus 2.0 defines electrical timing specifications for 33-MHz, 40-MHz, and 50-MHz operation and enhances the timing guidelines provided in the VL-Bus 1.0 specification. The VL-Bus 2.0 specification also allows for 3.3-volt peripherals, but only with peripheral chips integrated into the system board.

The new VL-Bus guidelines don't provide for auto-configuration, however. VESA here will depend on existing EISA and MCA auto-configuration features and on the upcoming plug-and-play ISA specification.

VL-Bus 2.0 changes allow design of VL-Bus/Pentium systems with performance similar to PCI ones. The question is whether chip and peripherals makers will support VL-Bus 2.0. Such systems would have no benefit over PCI Pentium systems beyond an ability to use existing VL-Bus cards, and existing cards wouldn't offer great performance because they don't support bursting.—DR

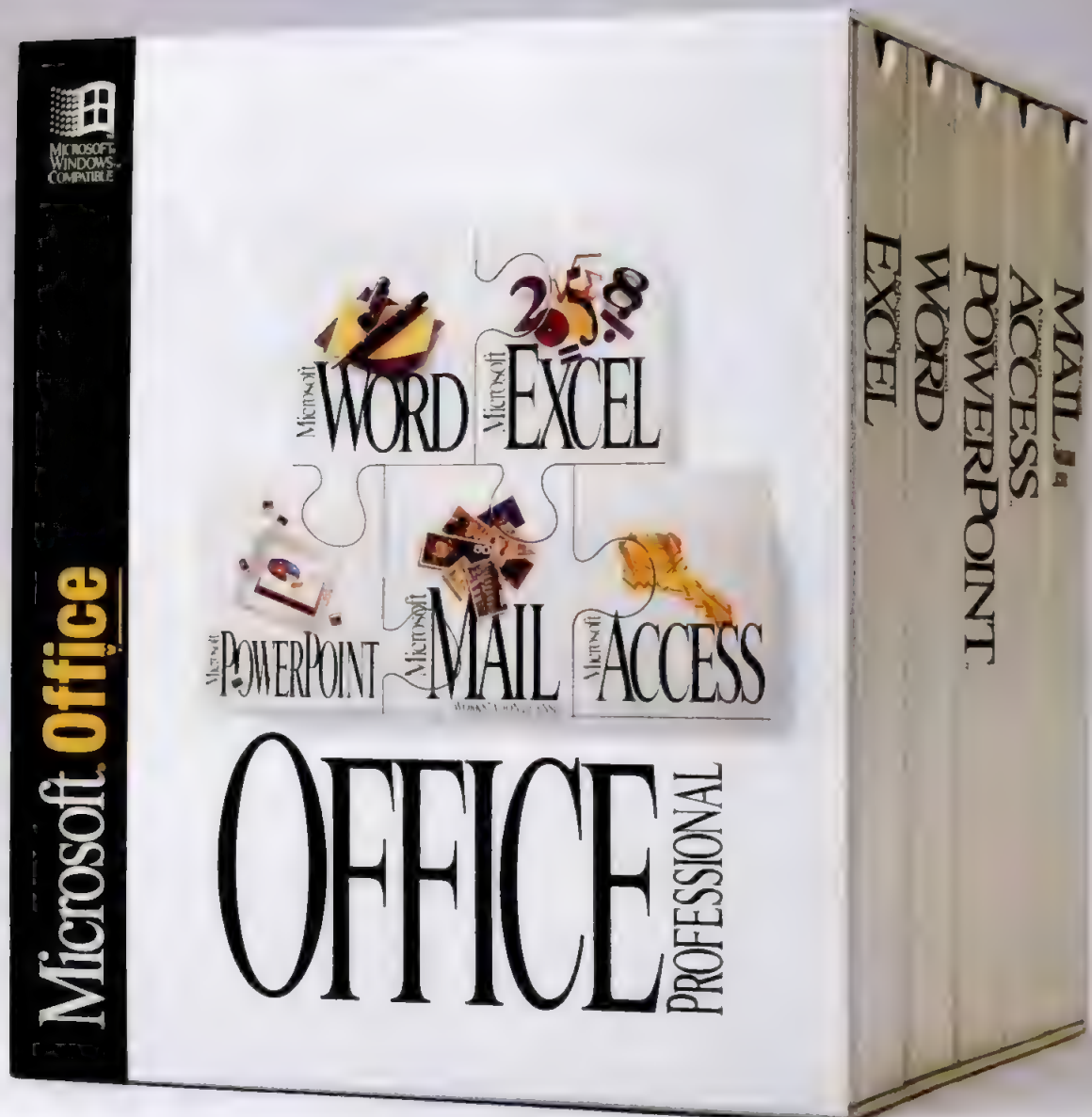
across several generations of a CPU. Because the PCI bus looks the same regardless of CPU, the same PCI peripheral card or chip should work equally well in 486, Pentium, Digital Equipment Corp.'s Alpha, and eventually Apple Computer's PowerPC-based Macintosh systems.

For instance, to owners of Digital Equipment Corp.'s Alpha PCs, PCI means a larger pool of less expensive peripheral products from which to choose. For peripherals with on-board ROM code, the PCI specification provides a boot-up mechanism so PCI cards can load different operating routines for dif-

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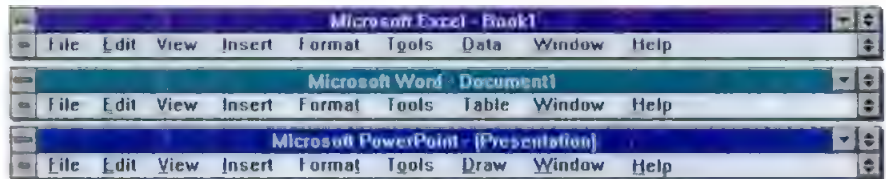
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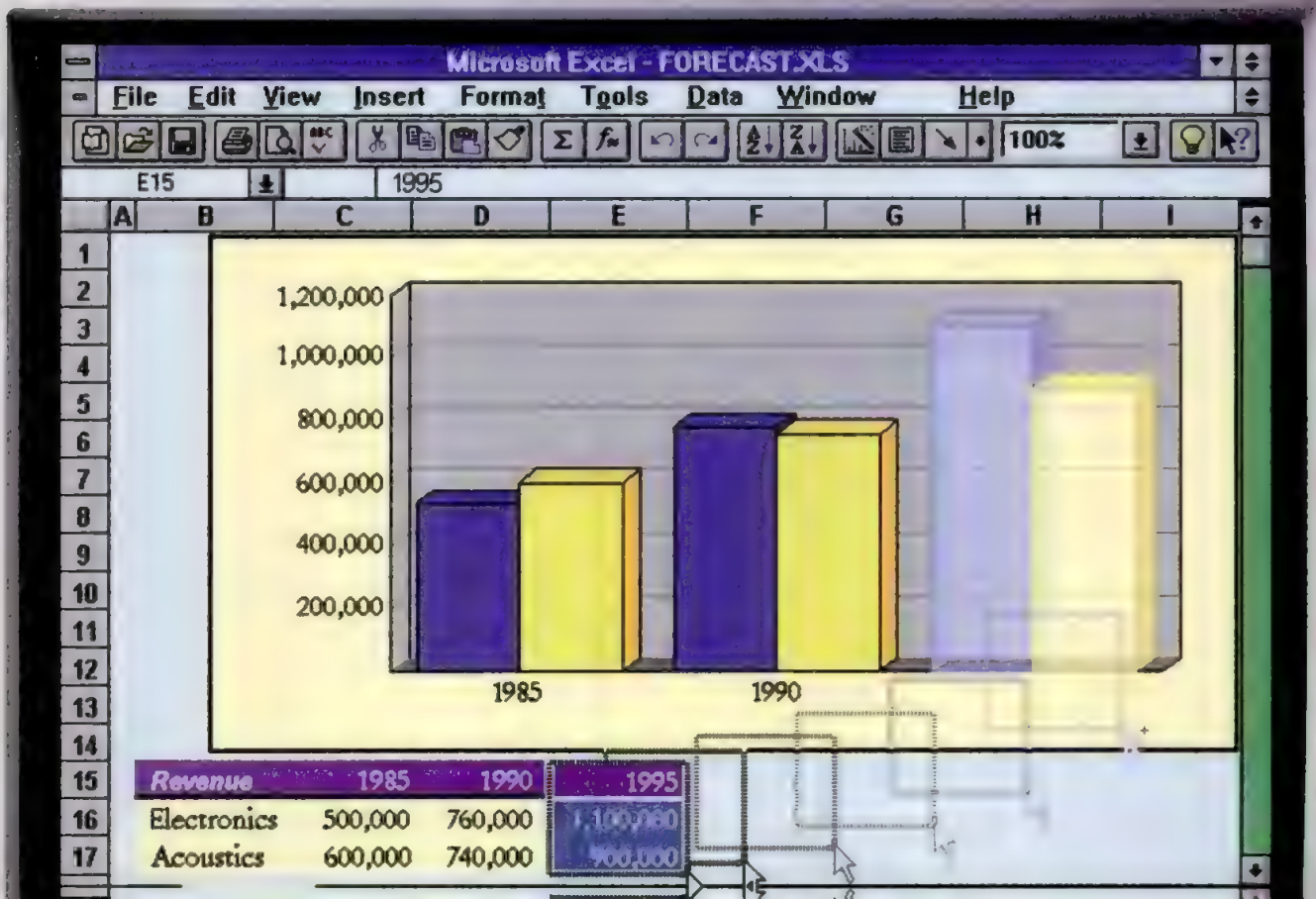
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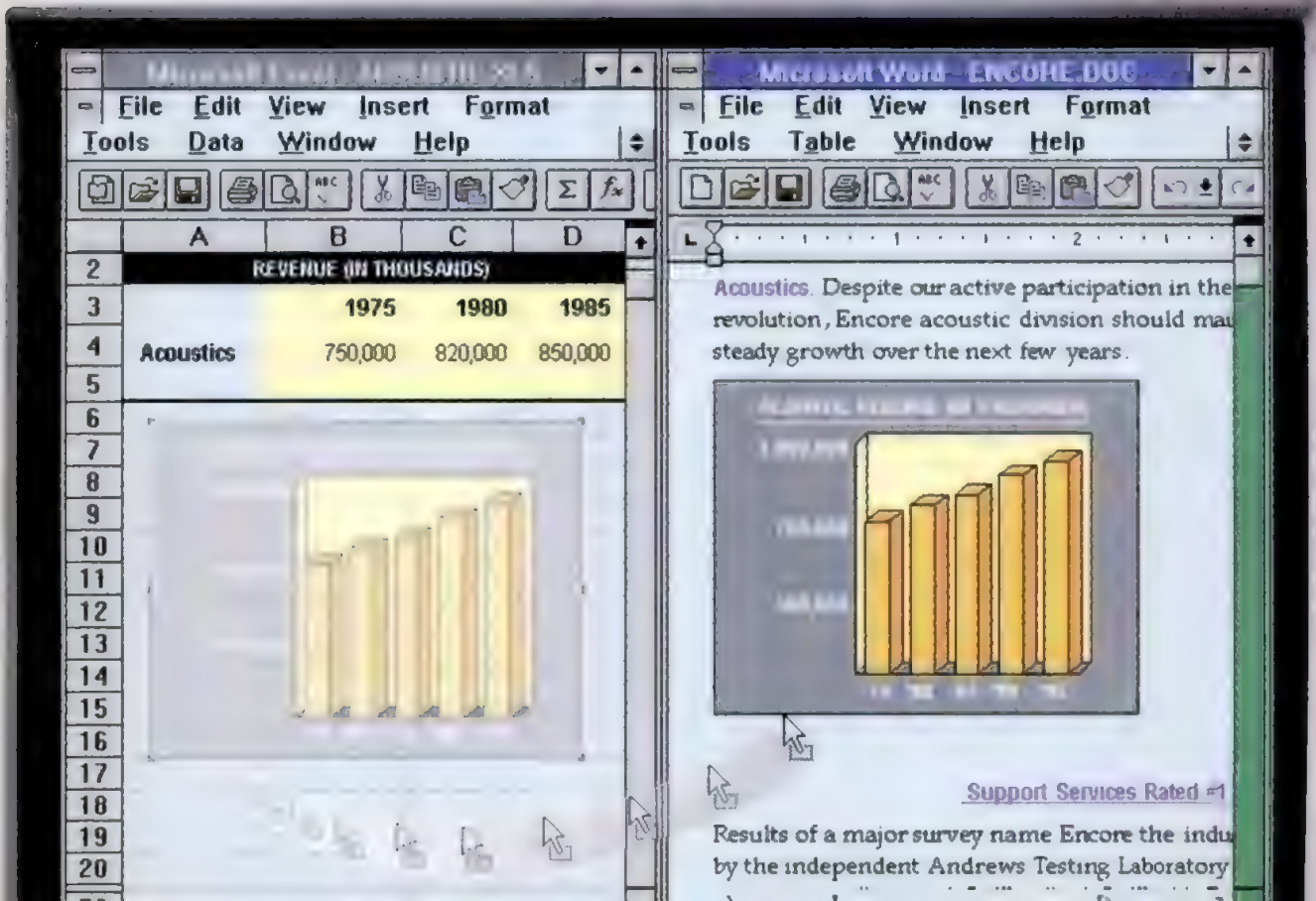
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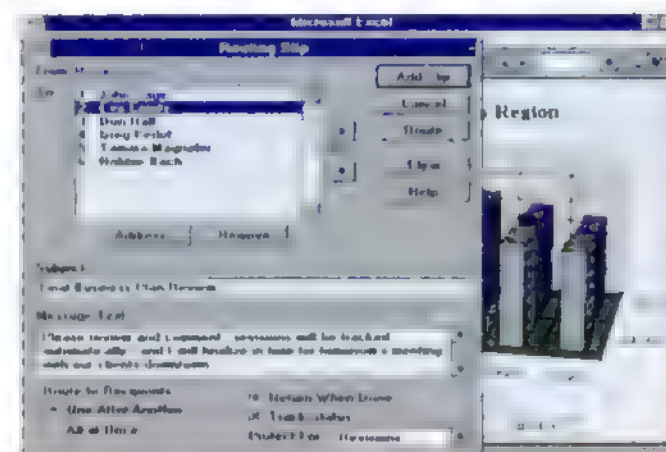
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ferent host systems. That means that cards with ROM programs will have to provide the built-in I/O routine specific to each platform. Digital, however, gets around this requirement by using its powerful Alpha processor to emulate Intel x86 ROM routines for PCI, ISA, and EISA cards. Any PC card should just plug in and work.

SELF-CONFIGURATION, FINALLY

PCI peripherals know who they are and are truly auto-configuring. A PCI board has configuration specifications set in memory on-board and provides installation information to the system during the boot-up phase of starting a system. BIOS routines then automatically configure each PCI device around the resources already in use by other boards. Ideally, you should never have to touch switches or jumpers in a PCI system.

Non-PCI boards will work in PCI systems, but that isn't as easy. The PCI system must know what's going on with such peripherals before it can configure PCI devices around them. This can be a problem with ISA cards. The short-term solution for existing ISA cards comes from PCI-configuration utilities that let you log in and store in flash memory the configuration needs of each of your ISA, EISA, or Micro Channel adapter boards.

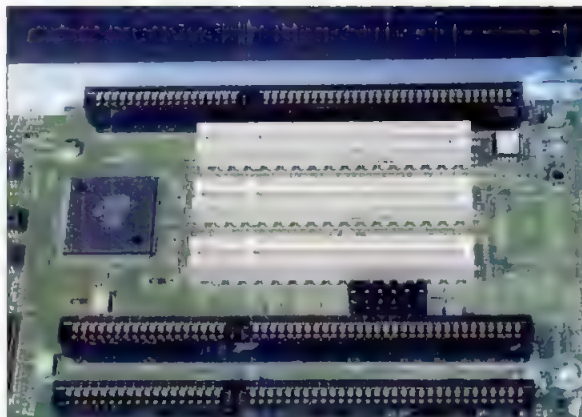
By the end of this year, we should see ISA cards that adhere to an auto-configuration standard that was developed by Microsoft, Intel, and a number of other manufacturers. This ISA standard will also make VL-Bus cards auto-configuring.

PCI systems and peripherals should also provide more reliable interoperability than their VL-Bus counterparts. The detailed nature of the PCI specification and the isolation of a PCI bus from a CPU bus help in this regard. The PCI specification describes the logical, mechanical, and electrical characteristics of a PCI bus in minute detail. In contrast, the loose nature of the VL-Bus specification forces a lot of compatibility testing. Unfortunately, not all vendors do the proper testing. A board that works in one VL-Bus PC may not work in another. Installing

two VL-Bus boards in one PC increases the likelihood of problems.

SPEEDY, NOT POWER-GREEDY

PCI's bus independence lets it run at a different speed from the CPU bus. The two speeds may be related, but that de-



PCI expansion slots, like the three white slots shown here, are shorter than standard ISA slots, yet provide far superior data throughput.

pends on circumstances. With Intel's Pentium PCI chip set, a 66-MHz system will run a PCI bus at 33 MHz, and a 60-MHz system will run at 30 MHz. All PCI peripheral devices must be able to run at 33 MHz, but with an ability to come to a dead stop for use in power conservation.

Breaking the processor-peripheral connection will allow hybrid systems that come equipped with 3.3-volt CPUs

and 5-volt accessories to simultaneously cut power consumption and heat production.

The PCI's bus isolation allows for such hybrid designs, but a true local-bus design like the VL-Bus doesn't permit these designs without buffering, which can hurt performance by adding delays to every bus transaction. But the VL-Bus will be able to take advantage of future 3.3-volt CPUs which are 5-volt tolerant.

In fact, PCI defines both 3.3-volt and 5-volt expansion cards. The difference between the two types of cards comes down to the placement of a small cutout in a card's bus connector. The position of the cutout keeps you from plugging a card of the wrong voltage into the motherboard. To ease the transition from 5-volt to 3.3-volt PCI buses, hardware vendors can design universal cards that plug into and work with either 3.3-volt or 5-volt PCI slots.

LOCAL BUS BANDWAGON

Who has jumped on the PCI bandwagon? Influential computer companies like IBM, Compaq Computer Corp., Hewlett-Packard Co., Digital, NCR Corp., and Texas Instruments are among those that are pushing PCI strongly. Ironically, one of the biggest PCI proponents is Ap-

■ PCI vs. VL-Bus: *Highlights*

- PCI offers performance superior to the VL-Bus on Pentium systems. At the 486 level, PCI and the VL-Bus give essentially equal performance.
- PCI provides an elegant hands-off auto-configuration system. PCI peripherals configure themselves at boot-up. For similar ease of use, the VL-Bus awaits the developing ISA plug-and-play standard.
- PCI promises excellent compatibility because of its tightly defined specification and some extensive simulation testing. The VL-Bus's more loosely defined specifications

cause compatibility problems.

- PCI systems will cost more at first than equivalent VL-Bus systems at the 486 CPU level. Still, there'll be no price difference on Pentium PCs.
- PCI should eventually lower manufacturing costs, since it can be used with many types of CPUs with few design changes.
- PCI cards require just one small connector. VL-Bus cards are long and must be carefully inserted into an ISA or EISA socket, as well as a VL-Bus extension slot.

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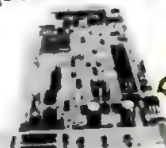


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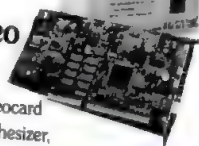
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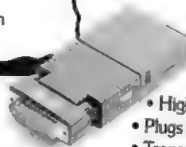
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ple, which plans to use PCI eventually to replace NuBus on PowerPC-based Macs. NuBus won't be phased out immediately; the first generation of PowerPC-based Mac computers will still offer NuBus. The most important outcome of this is that the Mac world can now choose from standard off-the-shelf PC peripherals instead of being limited to the Macintosh-only NuBus architecture.

Developers at Intel Corp. are doing their best to ensure that PCI develops a life of its own. The intent is to make PCI as universal a bus as possible and avoid the paths paved by the EISA and Micro Channel bus standards, both of which are very advanced, but neither of which ever won broad public acceptance on the

*Whether PCI will be the
bus of choice for the masses
or the domain of a small
clique of power users
remains to be seen.*

desktop. Intel has been busy marketing PCI to PC makers, large corporate customers, and, as you may have noticed lately, end users.

Contributing also to PCI's long development has been the complexity of implementing PCI support on motherboards and perhaps the apprehension concerning Intel's control of the specification. Basically, system-board builders have been waiting on Pentium-PCI and 486-PCI chip sets from Intel, though other companies are now providing competing products.

To allay fears of one-company domination, Intel formed an industry group, the PCI Special Interest Group, to control the specification and made several of its PCI-related patents available royalty-free.

The fact that PCI exists as a local bus at all is a quirk of fate. Announced at the same 1992 PC Expo trade show as VL-Bus, PCI products are only appearing now, over a year later. That's partly because PCI started as an interface to integrate peripherals onto motherboards; the

1.0 specification didn't even provide for expansion slots.

Triggered perhaps by the success of the VL-Bus, the industry group overseeing PCI released the new Revision 2.0 specification last May that provides for expansion slots, along with forward-looking options for 3.3-volt operation and 64-bit data access.

There is no doubt that PCI will live

up to its performance billing and provide a high-end alternative to more developed local-bus systems. Whether PCI will be the bus of choice for the masses or the domain of a small clique of power users remains to be seen. Beyond that, vendor support for the new standard and the careful documentation of the specification should guarantee PCI a long and prosperous life. □



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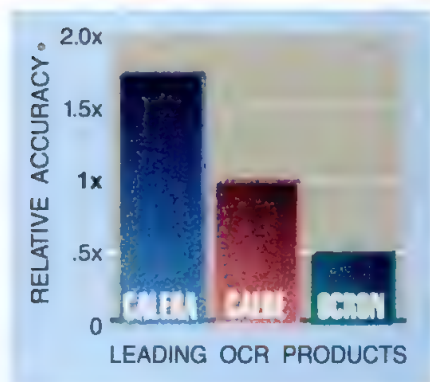
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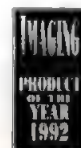
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Can Form Follow Content?

by Pauline Ores

The paperless office is right up there with the best of oxymorons. The way we see it, computers seem to have done little to diminish the flow of paper through the office, but there's still hope. A handful of new products designed to promote the wide use of portable electronic documents has arrived.

Portable documents are more than just electronic ASCII text files. The formats they preserve—including font and graphic information that exists in the original copy—will be duplicated regardless of the computer platform to which the document is sent. In addition, these electronic documents obviously have an advantage over their paper versions by giving you search capabilities. Being able to view several issues of *Time* magazine on-screen is not especially helpful if you can't search for and

retrieve the information you need, such as articles about computer technology.

These portable document solutions don't offer any document-management or document-editing capabilities (for now, you can only view and annotate). These products do, however, allow users to create documents that can be carried from one computer or platform to another without losing any of their native graphics, formats, or style—hence the name *portable documents*.

How do you exchange documents across different platforms? Adobe Acrobat, Common Ground, and Replica attempt to solve that riddle.

Portable document exchange solutions differ from some other categories of electronic document software in that they are not standalone applications. They work relatively seamlessly from within the applications we use today and rely on a page metaphor when displaying and handling documents. The three new portable document interchange solutions that

Portable Document Software

have recently come to market are Adobe Systems' Acrobat, Farallon Computing's Replica for Windows, Version 1.0, and No Hands Software's Common Ground. Acrobat is the most complex of these products because it is a cross-platform solution (Windows and Macintosh) with separate components for document creation, document viewing, and working with PostScript files. Since Common Ground is only currently available on the Macintosh, we review it in the sidebar "The Common Ground."

These document exchange products are directed at the bulk of the market, namely corporate and individual users. All three products use a page metaphor for document creation as well as for on-screen presentation. And because they are simple to use—at least on the surface—you don't have to learn another complex application.

Each document exchange solution comprises two parts: a creation application (usually in the form of a printer driver utility) and a viewing application that allows users to view or to read the resulting portable document file. All three packages achieve virtually the same objective: allowing you to send a document, which has been created on one platform using specific applications and fonts, to a recipient who can then view that same document just as you intended, regardless of what type of system or installed software he or she has.

How difficult are these packages to use? If you can print a file, you can create a portable document. You start by creating a document in its native spreadsheet, word processing, page-layout, graphics, or whatever document program you prefer. Then, using the standard Print Setup dialog box, you select a portable document print driver, which will capture the document as a "portable document image" rather than actually sending it to a printer. Each portable document print driver saves this document image to disk in a different proprietary format: Common Ground creates a Digital-Paper file; Replica has its Replica format; and Acrobat employs its Portable Document Format (PDF). To view the resulting file, one needs the corresponding document viewer.

Sounds simple, but while these programs offer a deceptively small number of menu items or options, capturing and displaying documents across platforms are greater and more complex challenges than they appear to be initially. And, given all the upcoming op-

erating system changes expected in the next year, they can be almost Sisyphean tasks.

Each of these products has taken a different approach to solving the problems inherent in cross-platform portable document interchange. Remember, although they come in boxes, these are solutions, not applications.

BASIC DIFFERENCES

The three products differ mainly in the particular technology each employs and how each expects to make its proprietary format a new standard. Another area in which these packages differ is image resolution; that is, the dot-per-inch measurement of the on-screen display. Both Replica and Common Ground rely on the native operating system to rasterize the screen image of the page for their proprietary formats. Common Ground's DigitalPaper format captures this information at four fixed resolutions, while Replica only uses fixed resolution information for bitmapped fonts and graphics. Replica relies on scalable outlines for TrueType and

vector-based graphics. This differs from Acrobat's approach, which is to base the Portable Document Format on PostScript, counting on it to provide a resolution-independent image of the page.

Each of the packages provides a creator that allows the user to print to a portable document format. Acrobat differs from Replica and Common Ground in that it offers a number of paths to document creation and reading. Acrobat Exchange handles the bulk of the tasks by converting documents to the PDF format. It also allows you to annotate documents and search for content. The Acrobat Distiller is used for professional publishing. It creates a PDF file by interpreting and transforming PostScript files. This is invaluable for users who work with programs that are focused on generating PostScript code or those who incorporate Encapsulated PostScript (EPS) files. As a rule, PostScript applications do a less than stellar job of creating non-PostScript printing information, which makes it

HIGHLIGHTS

Portable Documents

COMMON GROUND AND REPLICA

both rely on their native operating systems to rasterize the page for their proprietary document formats, while Adobe has based its Portable Document Format on PostScript. Adobe is counting on PostScript to provide a device- and resolution-independent image of the page.

HOPING TO GAIN widespread acceptance of their proprietary formats, Common Ground and Replica both allow users to embed a "free" viewing application in their documents. Farallon also allows the Replica Viewer to be extracted and used with other documents.

FONTS constitute the thorniest issue for portable document applications. Developers of portable document software rely on three methods of dealing with "missing fonts"—font embedding, font mapping, and font representation.

EXCHANGING GRAPHICS FILES may be too much for most users' systems to handle, so portable documents need to embed a minimum amount of font information and need to be able to compress data, particularly graphics information.

ACROBAT'S Portable Document Format is based on a seven-bit ASCII standard consisting of printable characters for platform independence that allows for cross-platform exchange.

OTHER ELECTRONIC DELIVERY applications, such as Electronic Book's DynaText, Folio Views, FrameMaker, and Interleaf's World-View are available with many of the features that these portable document interchange solutions have promised to add—such as SGML support. But they are more complex and are best implemented by specialists.

Portable Document Software

hard for Acrobat Exchange, Common Ground, and Replica to do their jobs. Additionally, Acrobat Distiller can incorporate complete EPS files, offering users the same ability to zoom in to progressively more detailed images.

Because you need a viewer to read a document file, the acceptance of these proprietary file formats depends on the number of viewers that find their way into the market. After all, your intended recipients can't read the file if they don't have the viewing software. Common Ground and Replica both allow users to embed a "free" viewing application in their documents. The Replica Viewer can even be extracted and used with other documents.

Adobe Exchange includes viewing software. Adobe also offers a rather limited, less expensive version of Acrobat Exchange, called Acrobat Reader, which does everything Exchange can do except allow the user to create PDF files and annotate documents. Adobe, however, does not allow users to embed or freely distribute its Reader or Exchange products. Unlike the viewing components of Replica and Common Ground, Acrobat's viewing is made up of several parts: ATM, two Multiple Master fonts, two Type 1 fonts, and the viewing software.

While there are overall differences among the products, it's impossible to say that any one solution is better than another. Each product has its strengths and weaknesses, therefore each user and document type will be best served by a different approach. It's another case of software imitating life—every choice has its pluses and minuses.

THE ISSUES

Most documents primarily consist of text, and that makes fonts probably the most important but thorniest issue portable document applications have to deal with. Today, many documents travel from machine to machine in ASCII format, disregarding font information. All of these products attempt to keep font information traveling with the document. How-

ever, it is unlikely that all the people to whom you send a document will have all the fonts you used in creating the document. In that case, how can a portable document interchange solution ensure that the recipient ends up viewing a similar-looking document?

It's not easy given the number of font technologies that might find their way into a document. Both the PC and Macintosh can work with bitmapped, TrueType, Type 1 and Type 3 fonts. Unix, of course, offers another Pandora's box of font possibilities. The same font on one platform may operate somewhat differently on a different platform. Even



bitmaps, the simplest of font formats, are displayed at different resolutions on the Macintosh and PC platforms. TrueType and Type 1 fonts are the most popular formats, and, as outline fonts, they are inherently scalable at any resolution. They work well on-screen and can be used to create high-resolution typeset output. Bitmapped fonts, which are usually intended for screen display, may be physically scalable, but in doing so you sacrifice resolution. They need to be designed to work properly at different resolutions, requiring a system to maintain a complete set of bitmapped fonts for each expected resolution.

Portable document software vendors have three methods of dealing with "missing" fonts: They can ignore them, include them, or imitate them. In more technical terms, they can rely on font mapping, font embedding, or font representation.

With font mapping, which is used by Replica, the application uses information it gets from the document (providing it with the characteristics of the missing

font—whether it's a serif or sans serif face) and uses information about loaded fonts from the operating systems' TrueType fonts or Adobe Type Manager's (ATM) Type 1 fonts to pick the font that most closely resembles the missing one. This approach may be acceptable for an electronically distributed phone list, but it would certainly not be satisfactory for someone publishing a newsletter or corporate report. Acrobat, on the other hand, uses font representation for a more precise model.

If you're not willing to trust your documents to chance, the surefire way to deal with missing fonts is to embed the fonts

Portable document software vendors have three methods of dealing with "missing" fonts: They can ignore them, include them, or imitate them.

and send them along with the document. The problem with this approach is that fonts and their files are not small (see our chart, which illustrates how embedded fonts can affect a document's size), especially if you need to send a lot of them. Of course, there is also the issue of font licensing.

As a rule, users are not licensed to send their fonts to other users. Portable document packages, while not changing the user's original license, have been designed to make this practice more palatable to the font vendors. The way both Replica and Acrobat do this is by permanently linking the embedded fonts to the document so that these fonts are not permanently installed on the recipient's system and are not accessible by any other application or document—sort of a read-only font strategy.

There is one other embedding strategy, in which the fonts are embedded in the software itself, rather than in the document. Adobe makes use of this strategy, bundling two typefaces, Symbol and ITC ZapfDingbats, with every Acrobat program. Adobe says there are 16 fonts that come with Acrobat that are not embedded per se, but are installed to the directory where the user stores his or her fonts.

Our Contributors: PAULINE ORES is a New York-based consultant who specializes in implementing desktop and on-line publishing technologies. GAYLE C. EHRENMAN was the associate editor in charge of this story and JEFF MACE was the project leader.

The Past as Future?

by Pauline Ores

It's been around forever, and it's one of those completely unsexy technologies, but the Standard Generalized Markup Language (SGML) represents the closest thing to a universal document language that we have. Many herald the technology as the keystone to the 21st century information services age.

SGML was introduced in the seventies and eighties as a solution to the many proprietary document typesetting systems—each with its own hardware, file format, and language for “tagging” or marking content elements such as numbered lists, headings, subheads, abstracts, footnotes. SGML comprises a single set of rules that specifies the structure of a document, independent of its format. So, for example, a certain tag might specify that the text that follows is a Level 1 chapter heading; information about that chapter heading's font, size, indents, and other formatting would be stored in a separate style-specifications file. Changing the style-specifications file can reformat the entire document.

Each class of SGML documents has an associated Document Type Definition (DTD) file that contains lists of allowed tagged elements and their hierarchical relationships. The DTD file explains the SGML tagging structure and can be used as a compiler to check and flag any noncompliant tags or element organization.

It's this programming-like aspect of SGML that gives it the potential to operate on a more profound level. That's because SGML is, in the largest sense, a truly object-oriented programming language designed for content manipulation. It's not, as is commonly assumed, a set of platform-independent style sheet tags. That means SGML allows you to access information stored in documents with the

same level of accuracy and detail you've come to expect from databases. Over time, SGML-savvy users have realized that tagging document elements more intelligently and with more detail increases the amount of information you can retrieve.

AIDING PORTABILITY

Anyone planning on using portable document technology is faced with two problems: the need to reformat documents for different media, and perhaps even more important, the need to access information “trapped” in an ever-growing repository of electronic documents. SGML is the only solution on the horizon that offers any hope of being able to solve both of these problems. This explains why, even before Acrobat's release, Adobe announced that it had licensed technology from Avalanche

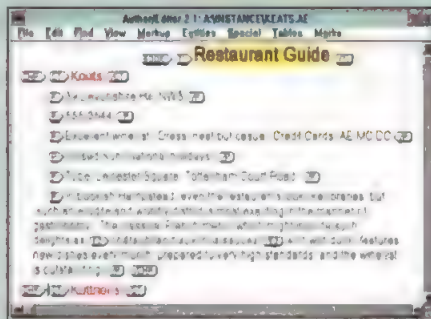
Development, a leading vendor in the field, to develop an SGML extension for Adobe's PDF files.

Avalanche Development (now owned by Interleaf), develops tools that automate the analysis and markup of existing documents using both embedded codes and visual recognition of text objects based on their page appearances. At the outset, this technology will make it possible for Acrobat to service existing SGML-dependent vertical publishing markets by allowing them to import and export their SGML files, using the SGML tags for enhanced navigation.

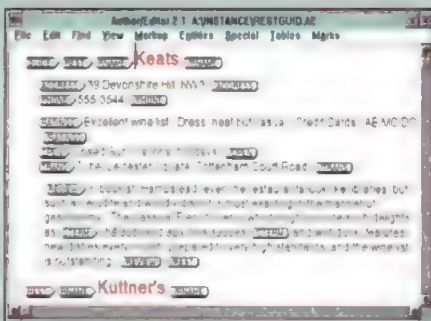
In an ideal world, this technology should allow Acrobat not only to convert SGML files to the PDF format but even to convert text that is not SGML-tagged into SGML-compliant PDF documents.

While SGML is certainly an enabling technology, implementing SGML-compliant solutions has not been a trivial task, and this has limited its adoption by technical and professional publishing markets. In order to take advantage of SGML, you must conform to its conventions and have all of your documents properly tagged and your DTD files carefully plotted out. Previously, these tedious tasks were done by specialized SGML experts. Now, companies like SoftQuad are developing applications such as its Author/Editor product, which can automate these tagging and markup tasks, making SGML more transparent and freeing end users from having to delve into the specifics of SGML coding. All of these strides will make it possible for SGML to help a greater number of users.

SGML may not rank as the most awe-inspiring technology, but one thing is clear: As we move toward storing greater amounts of information in documents rather than in relational databases, it is clear that SGML's strength—supporting cross-platform reformatting, intelligent navigation, and interactive documents—will make it an integral part of the future of information services. □



Shown here is sample text in SoftQuad's Author/Editor tagged for structure, with “P” representing a paragraph, “CHP” indicating a chapter heading, and “E2” specifying emphasis.



This sample has been tagged for content and offers much more information.

Portable Document Software

With font representation (or imitation), the software creates a close or even exact representation of a font without actually using the original font outline. Acrobat relies, though not exclusively, on ATM and its Multiple Master font technology. This system uses two fonts, a serif and a sans serif, that it modifies to resemble the original font. At least two other font-creation technologies exist that are different from Adobe's Multiple Master technology, but that can also create a simulation of fonts on the fly: Ares Software Corp.'s FontChameleon (\$295) and ElseWare's Panose-based Font Works (\$129.95). Both FontChameleon and Font Works are used by desktop publishing professionals to recreate fonts that may not travel with the document; these programs don't include the full viewer or the complete set of portable document tools.

All three products work in a similar manner. They capture descriptive information about a typeface—its font metrics, such as the character widths, stem widths, italic angle, and cap height. Because all of these elements are negligible in size, they can be sent with a document. The font products then use this information to create a typeface that resembles the missing one on the recipient's system. Ares and ElseWare's solutions differ from Adobe's Multiple Master approach in that they are both much smaller, use only one master typeface, and claim to be more versatile at replicating the nuances of distinctive typefaces, such as display faces, which is something that Multiple Master technology does poorly. (For more information, see the sidebar "A Look At Fonts.")

EVERY PICTURE TELLS A STORY

Graphics pose less of a problem for portable document software than fonts do, since they are not as platform-dependent and do not need to be installed in the system software. Aldus's TIFF standard and Adobe's EPS standard move from platform to platform with relative ease.

Of course, there are also PC-specific formats that are not to be found on the Macintosh, such as Windows .BMP, .PCX, and .WMF, as well as the Macintosh's Pict format, which doesn't exist on the PC.

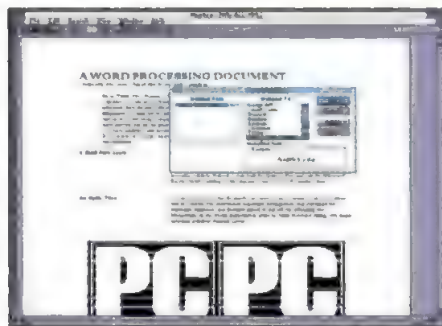
Therefore, the issue with graphics is not one of format, but rather of size. With the majority of users relying on relatively slow modems, analog phone lines, and medium-speed LANs, smaller is better for documents that will be sent via e-mail or made available on-line. For these reasons, portable documents need to embed a minimum amount of font information and be able to compress data, especially graphics information. All three of the currently available portable document packages offer some form of compression, based on existing accepted compression technologies such as JPEG, LZW, or run length encoding (RLE).

Regardless of which portable document solution you choose, you must be able to open a file on your desktop system, whether it's running DOS, OS/2, PowerPC, System 7, Windows, Windows NT, or one of the many Unix GUI standards. Acrobat's Portable Document Format is based on a seven-bit

ASCII standard consisting of printable characters for just that reason. Farallon and No Hands are currently offering single-platform solutions but have announced their intentions to offer software on other platforms and have chosen to deliver their files in binary format.

A DOCUMENT WITH A VIEW

Some of the most basic differences between these packages lie in their reader capabilities and distribution strategies. Adobe uses a "pay-to-view" scheme in which each copy of the viewing software must be paid for and/or licensed. Farallon allows users to bundle a full working copy of their viewing software with their document; this viewer can also be extracted from the document for reuse. No Hands provides an embeddable MiniViewer, which launches with the document and of-



Users can remap fonts from within Replica before or after saving a Replica file.

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Adobe PostScript

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True 600 dpi	Yes	Yes	Yes
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Emulations	PCL5/Adobe® PostScript® 2	PCL5E	PCL5E/Adobe PostScript 2
Compatibility	DOS/Mac	DOS	DOS/Mac
Toner Cart. Life	15K pages	6K pages	6K pages
Paper Trays	250 sheet/250 sheet	250 sheet/100 sheet	250 sheet/100 sheet
Auto Language Switching	Yes	No	Yes
Auto Interface Switching	Yes	Yes	Yes
Network Options	Yes	Yes	Yes
List Price*	\$1599	\$1759	\$2399

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fers limited search capabilities. This viewer cannot be reused, however.

How you choose to implement portable document solutions and whether you send a document to ten or 2,000 people will determine what sort of license agreement you need. Also, depending on the document, different viewing, searching, and navigational tools will be needed to take advantage of different types of documents.

All three portable document inter-

change solutions offer simple search and navigation tools. Acrobat only offers single-word searches, while Common Ground and Replica provide complex string and multiple word searches. None of these products index their searches, however, and if you're searching through long documents, be prepared for a long wait.

In addition to these search capabilities, Acrobat Exchange also allows users to place bookmarks and links within a docu-

ment. Bookmarks are text items that appear in a side menu and enable a user to access particular passages of a document quickly. Links allow you to connect related text passages, marking text to indicate a possible jump to another page or view.

TAKE NOTE

Annotating or modifying a document is an important piece of the pie for some applications and not that crucial for others; you don't typically want to annotate the electronic version of your automotive repair manual on the shop floor, but you might want to send a press release that's marked up with a personal message from you to a colleague. Only Acrobat Exchange—but not Reader—allows you to place postage stamp-size notes that can be expanded with a single mouse click.

Because none of these portable document files are editable in their native form, users cannot make any real changes. The files do allow you to extract text and graphics from your portable documents, but offer different implementations of these features. They all copy to the Windows Clipboard, however, enabling you to paste information from your document into another application. Acrobat allows you to copy ASCII text. Common Ground allows you to copy ASCII text and bitmapped graphics. And offering the greatest number of options, Replica allows you to copy RTF text and vector and bitmapped graphics. For those who wish to limit or prevent the copying of text or graphics, Replica and Common Ground offer the option of creating a read-only document or of restricting selected copying functions.

PRINTOUTS

These portable document products go to great lengths to maintain the page as it was originally conceived. Because none of us are ready yet to give up paper output, all three programs allow users to print their documents. This has even led analysts to refer to this situation as "delayed printing," in which a document is sent electronically, only to be printed later by the recipient.

Common Ground offers only one printing option: 300-dot-per-inch (dpi) resolution, while Replica is resolution-independent. Acrobat's PDF format re-

■ The Common Ground

by Pauline Ores

Sometimes the name of the product says it all. Such is the case with No Hands Software's Common Ground. Currently available only for the Apple Macintosh, Common Ground will be available in a \$189.95 version for the Microsoft Windows environment by the end of the year. This new version promises to offer PC users the same ease of use, speed, and convenience for cross-platform document exchanges that its Macintosh sibling offers.

Like many other portable document programs, Common Ground consists of two components: Common Ground Maker (an alternate printer driver that can be selected as the active printer in the Macintosh Chooser) and Common Ground itself, which serves as the viewer.

The backbone of the program is Common Ground's proprietary DigitalPaper file format, which relies on QuickDraw—the graphics language of the Mac's operating system—in order to write to the screen. In the Windows version, DigitalPaper will rely on the Windows Graphics Device Interface (GDI), which is analogous to QuickDraw. These files and applications are relatively small, requiring 700K of RAM or less and taking up only 600K of hard disk space.

FILE CREATION

Common Ground offers two ways to create DigitalPaper files: by "printing"

files from an application to the Common Ground Maker printer driver; or by using Common Ground's AutoMaker.

To use the AutoMaker, you drag and drop a file onto the AutoMaker icon, which then launches the document's application (in Macintosh System 7), sets the correct Chooser setting, and prints and stores the final DigitalPaper files on the hard disk. Users can opt for a smaller file size by choosing not to include the higher 300-dpi resolution for printing.

No Hands Software has announced an enhanced Macintosh version of Common Ground, designed specifically for electronic book publishers, called Book (a Windows version will also be released at a later date). Book will enable readers on both platforms to perform indexed searches, add bookmarks, and highlight selected text. But for now, Common Ground's small application and document sizes address the needs of users who haven't upgraded to more powerful PCs with lots of RAM and large hard disks, making cross-platform document exchange accessible to more users. □

► FACT FILE

Common Ground
No Hands Software Inc., 1301
Shoreway Rd., #220, Belmont, CA
94002; 800-598-3821.

List price: \$189.95 (1 user).

Circle 492 on reader service card

File Sizes for Portable Documents

Files with different fonts tend to be quite large, which can slow the process of sharing your documents across platforms. This table indicates the file size of a sample word processing document and desktop publishing document when handled by each portable document package.

The original Microsoft Word for Windows document was one page long and included one nonsystem TrueType font, one PostScript font, and one .PCX graphic.

The original QuarkXPress document contained three TrueType fonts, ten Type 1 fonts, and links to a referenced EPS file (not embedded) of 125K. As a PostScript file, the document was approximately 1.5MB large.

Sizes in kilobytes

	Microsoft Word for Windows Document	QuarkXPress Document
Original format	32	1,538 (PostScript)
Acrobat PDF Writer	10	295
Acrobat Distiller	56	507
Common Ground (Macintosh)	20	266
With high-resolution printing information	30	176
With high-resolution and MiniViewer	94	240
Replica		
No fonts	6	48
Optimal fonts	7	48
All fonts	61	48
With Viewer file (optimal)	479	520

lies on the resolution-independent PostScript model and thus offers more flexible output options. This is because PostScript is a device-independent page-description language that captures all the elements of a page, such as the fonts and graphics used, and stores them as scalable elements, as does the PDF file in most instances. When the file is ready to be output, say on a high-end imagesetter at 2,400-dpi or on a 600-dpi laser printer, the PostScript interpreter creates a separate rasterized version, turning the page into the bitmap on which printing devices rely.

But printing is not the primary goal of these packages. As these programs gain more and more computer-based features, or users begin to work with larger and larger documents, on-screen viewing and printing won't really mix.

Even Adobe, which has even chosen not to provide printed manuals with its software, is caught in the same bind. For on-screen ease of use, the company has designed a smaller, screen-proportioned page (approximately 6.5 inches wide and 5.5 inches tall) that does not require a user to scroll up and down for viewing. Although this size fits onto a printed 8.5- by 11-inch page, it's not a very efficient use of paper.

This is a perfect example of a situation in which you have the same content you wish to use for two purposes: on-screen display and printed output. In essence, you want to be able to repurpose the content, which is something present incarnations of portable document interchange applications are not set up to address. This is why Adobe and many others have

decided to rely on added Standard Generalized Markup Language (SGML) enhancements to correct this shortcoming. (For more information, see the sidebar "The Past as Future?")

With the basic issues sketched out, it's time to take an in-depth look at how each of these products stands up to the challenge of creating an electronic document.

FARALLON'S REPLICA

Primarily a networking hardware company, Farallon Computing first explored the field of portable document software with a product called DiskPaper that received a lot of press but was never released.

In August, Farallon released a Windows-only version of Replica, a small portable document application. (A Macintosh version of the program is set for release by the end of this year.) The application itself is only 243K and the Help file (available in Windows Help format) is only 224K; together, they fit onto one floppy disk. Not very demanding when it comes to system memory, Replica can get by on 2MB of RAM and can run successfully on a 286-based processor.

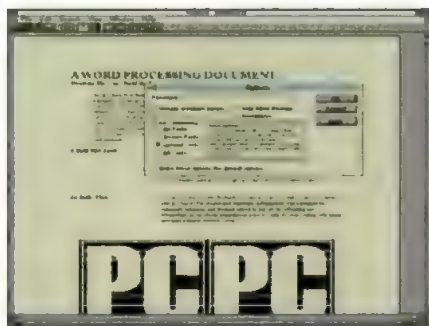
Replica has several unique features, one of which reflects Farallon's networking background: It sports built-in e-mail capabilities. It supports the MAPI and

VIM e-mail standards, it can create direct links to Lotus's cc:Mail and Microsoft Mail, and it can send files via e-mail without forcing the user to leave the program. It's also the only program that allows recipients to copy and paste RTF text and vector and bitmapped graphics to the Windows Clipboard, provided they are not using a read-only file.

Replica's creation metaphor features an interesting twist. Once your application has finished printing the document, the Replica program launches and comes into the foreground. At that point you can use the pull-down menus to select options, such as Embed Viewer, then you name and save the file to complete the creation process.

The Replica format uses the Windows GDI to rasterize the image on-screen. Farallon describes its portable document format as a superset of GDI and QuickDraw commands or calls. Farallon claims that its intentions are to publish its format

specifications and work with SGML, document-management, and API technology to create a complete electronic document solution. The original release, discussed in this article, provides bitmapped screen representations of Type 1 fonts, which as graphic images could not be accessed by the Replica search engine or be mapped to another typeface. This is no longer true



Replica lets you protect documents with passwords or by saving the files in view-only mode.

Portable Document Software

for the most recently announced version, 1.01, which will be available by the time you read this.

Farallon's font strategy (with Version 1.01 of Replica) is to embed all nonsystem TrueType fonts that are embed-enabled. The vast majority of TrueType fonts, such as those provided by Agfa, Bitstream, Image Club, ITC, and Microsoft, are embed-enabled; a handful of fonts are not embeddable. (You can see the result of a non-embeddable TrueType font by looking at the Chaucer example in "A Look At Fonts.") To keep files small, Replica uses subset embedding—that is, embedding only the characters that are used in a particular document.

Because Replica expects to find Windows system fonts on each viewing system, it doesn't automatically embed them. In the future, this option will be useful when sending files to recipients using Macintosh Viewers. If the package is set to any option other than "No Fonts" when it encounters a TrueType font that is neither a system font nor embeddable, it captures a bitmap of the font and displays it. If the "No Fonts" option is selected, Replica uses automatic font mapping to replace the missing font.

With Version 1.01, if Replica can find the same Type 1 font in the recipient's sys-

tem, it makes it available for display and printing. If it can't find the font, it displays the originally captured bitmapped version, using a 96-dpi bitmap for on-screen display and a 300-dpi bitmap for printing. Additionally, a user can choose to remap the missing Type 1 font to another installed TrueType or Type 1 typeface.

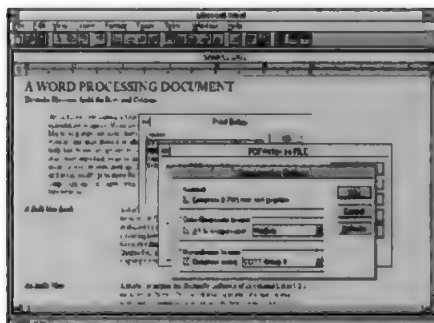
Again, the new version of the program captures the ASCII data as RTF, as well as the font name and a bitmap of Type 1 formatted text. Additionally, this enables Replica 1.01 to search text that has been formatted with Type 1 fonts. Replica, like Common Ground, can perform simple searches for multiple contiguous words using matching case and whole word specifications.

Replica files are automatically compressed and encrypted and can be password protected or designated "View Only." A sample one-page Microsoft Word for Windows document that included one nonsystem TrueType font, one

PostScript font, and one .PCX graphic was 32K in its native format, without any font embedding, 7K with optimal font embedding (no embedding of system fonts), and 61K with all the fonts embedded. For the sake of comparison, the same file in PDF format was approximately 10K. (For more information, see our chart "File

Sizes for Portable Documents.") Farallon, possibly in its efforts to seed this market, has adopted one of the kindest user approaches to reader distribution: It gives authors the right to embed a full-fledged Replica Viewer for free. What's more, this Viewer installs itself on the user's sys-

tem, so you only have to send it once to a recipient who will be receiving additional Replica files. In addition to such generosity, the authoring program has a built-in trial program that allows users without valid serial numbers to create five Replica documents. All of these offers are geared to ensure Replica becomes a widely distributed, installed, and familiar portable document interchange format.



Adobe's PDF Writer offers several compression options for printing documents.

A Look at Fonts

The way each of these products handles fonts affects the look of the document.

single device, making mail management much easier

TrueType
Americana @ 12 points
Arial System font @ 12 points
"♠♣♥♦ & Chaucer"
Type 1 Font
Caslon Regular @ 12 points
Ligatures go first

The sample Microsoft Word for Windows document contained an EPS file, two system TrueType fonts, two nonsystem TrueType fonts, one normal Type 1 font, and three non-ISO Latin 1 character sets.

single device, making mail management much easier

TrueType
Americana @ 12 points
Arial System font @ 12 points
"♠♣♥♦ & Chaucer"
Type 1 Font
Caslon Regular @ 12 points
Ligatures go first

Acrobat's Distiller handles fonts in a similar manner as the PDF Writer. The difference you see is caused by a bug that prevented the Windows PostScript driver from passing the TrueType font names to the PostScript file.

single device, making mail management much easier

TrueType
Americana @ 12 points
Arial System font @ 12 points
"♠♣♥♦ & Chaucer"
Type 1 Font
Caslon Regular @ 12 points
Ligatures go first

Acrobat Exchange's PDF Writer first sees if any of the fonts, such as Arial, are available on the system. If so, it uses them; if not, it replaces them with fonts created using its Multiple Master technology.

A traditional mail business has two workgroup layouts
single device, making mail management much easier

TrueType
Americana @ 12 points
Arial System font @ 12 points
"♠♣♥♦ & Chaucer"
Type 1 Font
Caslon Regular @ 12 points

Replica, set to optimum by default, embeds all embeddable nonsystem TrueType fonts and captures bitmapped versions of all Type 1 fonts. Chaucer was not embed-enabled, so Replica displayed it as a bitmap.

No wonder everyone is moving to **Austin.**

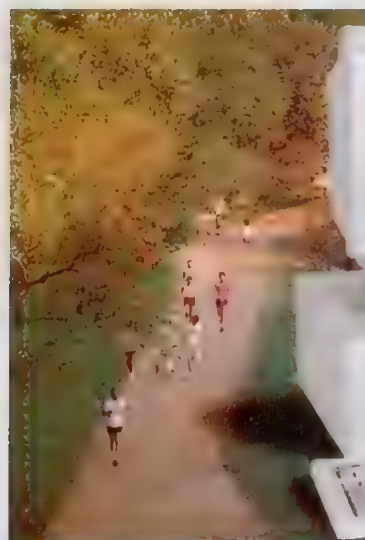


Austin, the city, and Austin Computer Systems
both offer variety, quality, enjoyment,
and promote a clean, productive,
healthy lifestyle.



*The Austin 486SX-33 MediaMagic™ System
is the multimedia system that you can enjoy and afford!
Its Energy Star™ design will save you money now — and in the future.*

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February 11, 1992
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Austin makes Intel's fastest processor affordable!

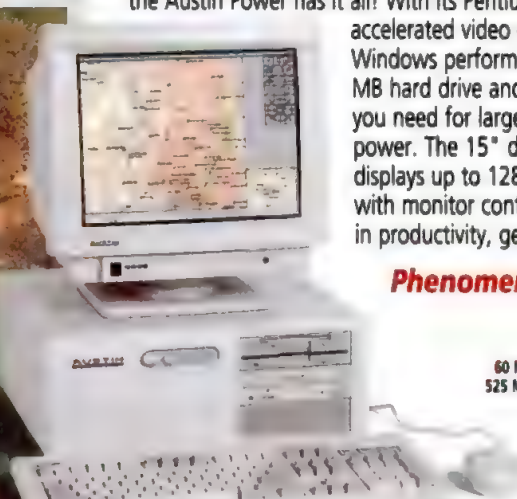
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Multimedia Power!

486DX2-66 \$2,999.

8 MB RAM, 128KB Level 2 Cache, 340 MB Hard Drive, Toshiba 200ms CD-ROM drive, DSP-16 Plus Audio Board, speakers, 1 MB Local Bus Windows Super Accelerator, 15" Digital NI SVGA monitor, Baby-AT case, 4 ISA and 2 VESA/ISA slots

Feature Rich 486 Performance Systems

The best value in PCs!

Austin's 486 VESA local bus systems feature accelerated local bus video with 1 MB of DRAM, dual floppy drives, fast hard drives, and upgradability to Pentium OverDrive technology. The 128KB level 2 cache improves performance 19% over cacheless systems on DOS and Windows applications.

Best Buy!

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Accelerator, 15" NI SVGA monitor, Baby-AT case,
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Never has so much power been so affordable. This 486SX system with 33 MHz features accelerated video and 212 MB hard drive. The pre-installed DOS and Windows software requires no installation, so you'll be creating letters, mailing lists, and budgets within minutes of opening the box! And our Energy Star design saves you money by using less electricity.

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Local Bus Windows Accelerator, 14" SVGA monitor,
EPA Energy Star approved power conservation,
compact low-profile case, 5 ISA slots



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All Austin Notebooks feature a 32-bit local bus Windows accelerator for the best notebook video performance available. With the active-matrix color models, you get a crisp, clear screen and the advantage of simultaneous CRT and LCD display. Our new models feature the latest DSTN Dual Scan LCDs for color at an affordable price.

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Green PC ... was the clear winner."*

— PC World, August, 1993

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Windows Accelerator, 14" NI Super VGA Monitor,
EPA Energy Star approved power conservation,
compact low-profile case, 5 ISA slots

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Intel Pentium CPU Operating at 60 MHz
8 MB RAM Expandable to 64 MB
256 KB Level 2 Writeback Cache
3.5" Floppy Drive
Super Accelerated PCI Local Bus Video with
2 MB VRAM
15" Digital Memory Non-Interlaced Super VGA
Color Monitor
Compact Desktop Case
Three 5.25" HH Bays, Two Internal 3.5" Bays
200 Watt Power Supply
Four 16-Bit ISA, Two 64-Bit PCI, and
One PCI/ISA Slot

Pentium 60	525 MB	10ms	IDE	\$3,999
Pentium 60	525 MB	10ms	SCSI	4,249
Pentium 60	1.05 GB	10ms	SCSI	4,749

486 MediaMagic Systems

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3.5" Floppy Drive
MediaMagic ISP-16 with Sony 31A/03
Double-Spin CD-ROM and Speakers
Accelerated Local Bus Video with 512 KB DRAM
14" Super VGA Monitor
Low Profile Case
Two 5.25" HH Bays, One 3.5" Bay,
One Internal 3.5" Bay, 150 Watt Power Supply
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EPA Energy Star Approved Power Conservation

486SX-33	SVGA	212 MB	13ms	\$1,749
486DX-33	NI SVGA	250 MB	13ms	1,999
486DX-66	NI SVGA	340 MB	13ms	2,349

486 MediaMagic Pro System

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MediaMagic DSP-16 with Toshiba 200ms
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Super Accelerated Local Bus Video with
1 MB DRAM
15" Digital Memory Non-Interlaced Super VGA
Color Monitor
Compact Desktop Case
Three 5.25" HH Bays, Two Internal 3.5" Bays
200 Watt Power Supply
Four 16-Bit ISA and Two 32-Bit VESA/ISA Slots

486DX2-50	340 MB	13ms	\$2,749
486DX2-66	340 MB	13ms	2,999

486 For Home, Office, Dorm

4 MB RAM Expandable to 32 MB
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Low Profile Case
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3.5" Bay, 150 Watt Power Supply
Five 16-bit ISA Slots
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486SX-25	212 MB	13ms	\$1,299
486SX-33	212 MB	13ms	1,349
486DX-33	250 MB	13ms	1,649

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128 KB Level 2 Cache
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Accelerator
15" Digital Memory Non-Interlaced Super VGA
Color Monitor
Desktop Case
Three 5.25" HH Bays, Two 3.5" HDD Bays and
200 Watt High Efficiency Power Supply
Four 16-Bit ISA and Two 32-Bit VESA/ISA Slots

486DX-33	250 MB	13ms	\$2,159
486DX2-50	340 MB	13ms	2,259
486DX2-66	424 MB	13ms	2,499

Austin 486 Notebooks

Intel 486SX, DX, or DX2 Processors
4 or 8 MB RAM Expandable to 32 MB
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Monochrome, Dual Scan color, or
TFT Active-Matrix Color Monitor with
Simultaneous Display
85-Key Keyboard with 16mm Front-and-Center
Trackball
Two Serial Ports, One Parallel Port
Two-Hour to Five-Hour Battery Life
11.1" x 8.58" x 2", 6.3 lbs.
One-Year Warranty

486SX-25	Mono	130 MB	\$1,899
486SX-25	DSTN Color	130 MB	2,199
486DX2-66	DSTN Color*	213 MB	2,999
486DX2-66	Active Color*	340 MB	4,499

* 8 MB RAM

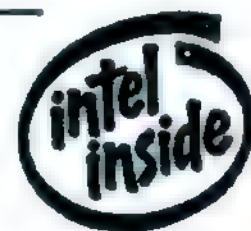
486 Austin Green PCs

4 MB RAM Expandable to 32 MB
8 KB CPU Cache and 128 KB Level 2 Cache
Dual 5.25" and 3.5" Floppy Drive
Integrated Local Bus 1 MB Windows Accelerator
14" NI Super VGA Color Monitor
Low Profile Case
Two 5.25" HH Bays, One 3.5" Bay, One
Internal 3.5" Bay, 150 Watt Power Supply
Five 16-bit ISA Slots
EPA Energy Star Approved Power Conservation

486SX-25	212 MB	13ms	\$1,539
486SX-33	212 MB	13ms	1,599
486DX-33	250 MB	13ms	1,789
486DX2-50	340 MB	13ms	1,949
486DX2-66	340 MB	13ms	2,149

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101-Key Keyboard,
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choice of Lotus applications. Two-Year Warranty,
One-Year On-Site Service Policy.



► SUMMARY OF FEATURES

Portable Documents

Products listed in alphabetical order

■ = YES □ = NO

	Adobe Acrobat	Common Ground	Replica for Windows, Version 1.0
Company	Adobe Systems Inc.	No Hands Software Inc.	Farallon Computing Inc.
Components	Acrobat Distiller, Acrobat Exchange, Acrobat Network Distiller, Acrobat Reader	Common Ground Maker, Common Ground MiniViewer, Common Ground Viewer	Replica Creator, Replica Viewer
Price	Distiller: \$695 (1 user); Exchange: \$195 (1 user); Network Distiller: \$2,495 (unlimited users); Reader: \$50 (1 user)	\$189.95 (1 user)	\$99 (1 user); \$749 (10 users)
Platform	PC, Macintosh	Macintosh, PenPoint	PC
Application size (after installation)	Distiller: 4MB for PC, 4MB for Macintosh; Exchange and Reader: 2.5MB for PC, 2.5MB for Macintosh	Maker: 279K; MiniViewer: 65K; Viewer: 282K	243K
Minimum RAM needed	Distiller: 8MB for PC, 6MB for Macintosh; Exchange: 4MB for PC, 2MB for Macintosh; Reader: 4MB for PC, 2MB for Macintosh	2MB	2MB
Annotations	■	□	□
Export	Text only	Text and bitmaps	Text, bitmaps, and vector graphics
Search:			
Single word	■	■	■
Complex string	□	■	■
TrueType fonts	■	■*	■
Bitmap	■	□	■
Embed	□	□	■
Remap	□	□	■
Substitute	■	□	□
Type 1 fonts	■	■*	□
Bitmap	■	□	N/A
Embed	■	□	N/A
Remap	□	□	N/A
Substitute	■	□	N/A

N/A—Not applicable: The product does not have this feature.

* Common Ground, which is reviewed in the sidebar "The Common Ground," uses a proprietary scheme to handle and display fonts.

ADOBE ADOBAT

Acrobat, with its Distiller, Exchange, and Reader components, has the greatest breadth and the most options of any of these applications. Adobe brings a certain amount of marketing clout and a long history of working with documents to the portable document arena. In general, although you can nitpick over various features of Acrobat, Adobe is probably the company best suited to provide the needed technology for document exchange and a host of other electronic information services that will appear in the coming years.

It's no surprise that the PDF standard on which Acrobat relies is built around—or in conjunction with—the jewel in Adobe's crown, PostScript. PDF is also an extendable published standard that is

ASCII-based and thus compatible with almost all systems. Finally, PDF is a higher-level format than PostScript and is more structured, with support for objects such as annotations and hypertext links that are not part of the page description but are linked to it.

Like PostScript, each of Acrobat's three components is relatively large and unwieldy compared to its nearest competitors, requiring more hard disk space and RAM. Acrobat's PDF technology, however, also delivers more features. Acrobat Distiller takes up approximately 4MB of hard disk space and Acrobat Exchange takes up about 2.5MB. Adobe requires giving Exchange or the Reader at least 4MB of RAM, with 8MB recommended (2MB with 4MB recommended

VB Power



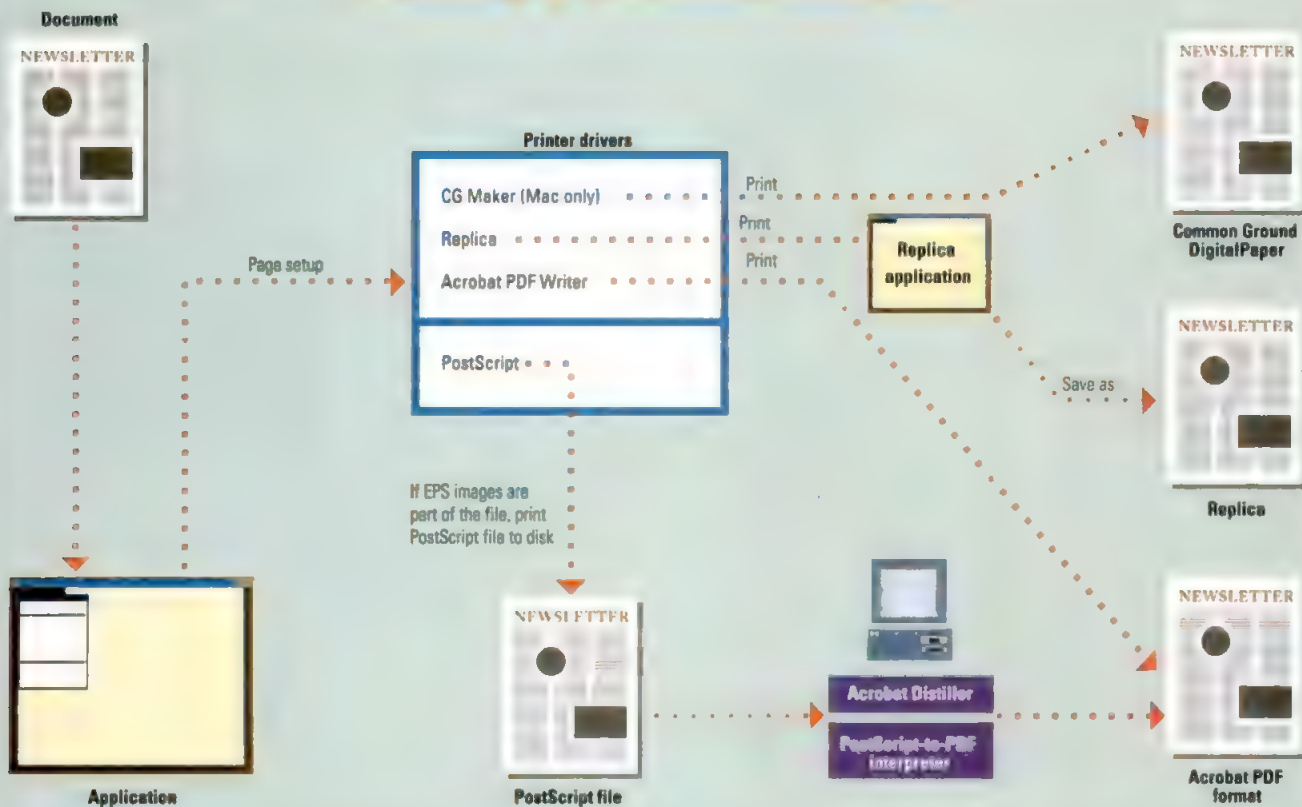
ISBN: 1-56276-073-4
Price: \$34.95

This innovative guide by Dan Appleman turns Visual Basic programmers into power users by illuminating the tools of the Windows Application Program Interface (API). Includes a time-saving disk that contains source code from the examples in the text, plus a specially designed dynamic link library (DLL).

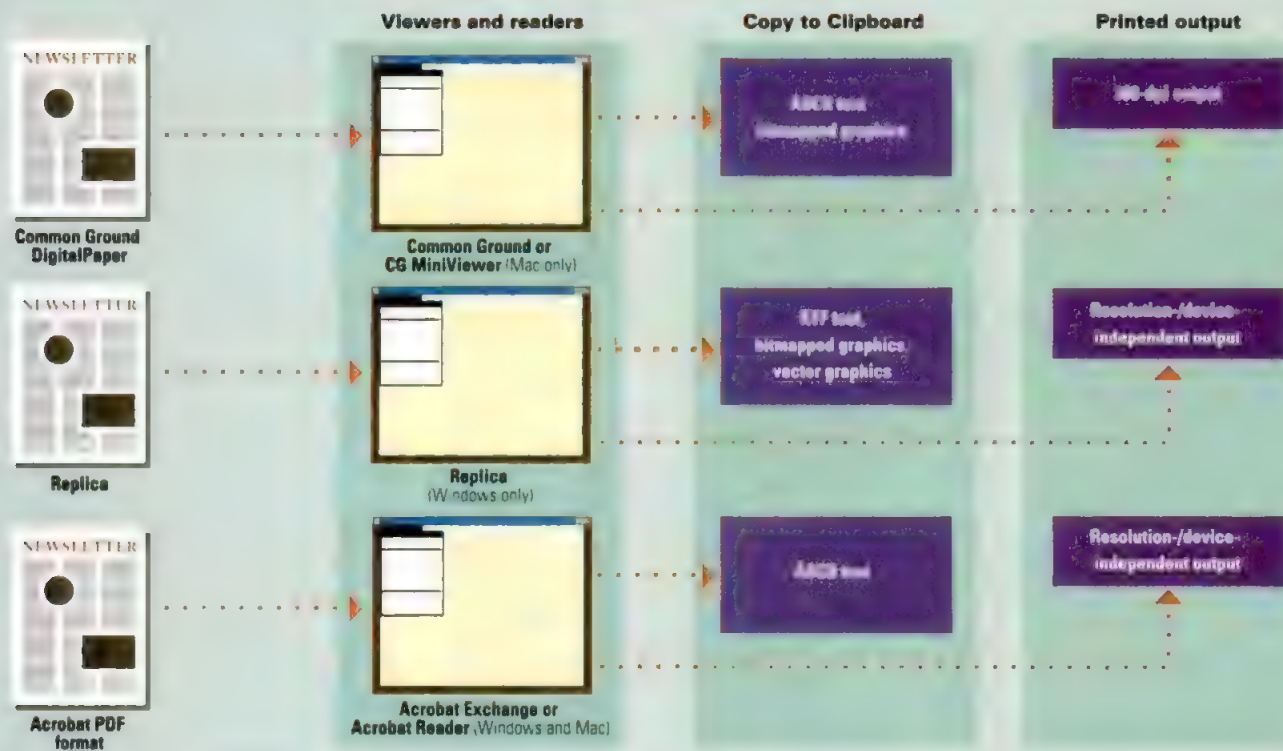


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Creating a Portable Document



Using a Portable Document



Portable Document Software

for the Mac version). The Distiller almost puts Adobe Photoshop for Windows to shame as the leading memory/computation hog with a minimum RAM requirement of 8MB on the PC and 6MB on the Macintosh. The Distiller is happiest running on a 486 DX or DX2 or Mac Quadra CPU, but it can make do with a 386 or 68020 CPU. The Reader, which functions as a viewer without any save or annotation capabilities, requires 2.5MB of hard disk space. It needs 4MB of RAM to run on a PC and 2MB to run on the Mac.

Acrobat offers two ways to create a PDF file. Acrobat Exchange uses a PDF Writer printer driver to capture an application's output to disk. The Acrobat component that is best suited for working with PostScript applications, such as Illustrator, PageMaker, and QuarkXPress, is called Acrobat Distiller, and functions as a PostScript interpreter, translating PostScript files into PDF files.

Both the Distiller and the PDF Writer offer a variety of compression options, including .LZW lossless compression for text and graphics, JPEG lossy compression for color and gray-scale images, CCITT Group 3 and Group 4 facsimile compression, and RLE for monochrome images.

While both the PDF Writer and the Distiller create PDF files, the files created by the PDF Writer do not contain full EPS files, only their screen resolution previews. You have to use the Distiller if you wish to capture all the data of the EPS file at high resolution. And although Acrobat offers the most elaborate graphic embedding options, the Exchange and Reader programs don't let users copy photos, line art, or any graphics from PDF files to the Clipboard. In contrast, Replica and Common Ground allow you to copy both text and graphics.

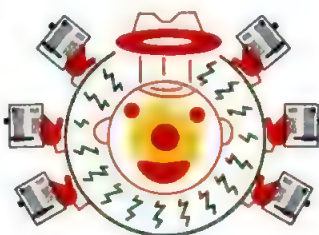
Acrobat, can be totally dependent on Adobe's Multiple Master font technology, and it can also embed font outlines for reuse with a specific document. When either component finds a font that falls within the standard Latin character set, it inserts a character metric description of that font (either Type 1 or TrueType) into the PDF file. This embedded information takes up about 2K for each font used in the document.

The font outlines for all Type 1 non-Latin fonts are embedded, except for the Adobe Symbol and ZapfDingbat type-

faces, which are included with the both Exchange and Reader. Non-Latin TrueType faces are made into Type 3 bitmaps and are saved at two resolutions, 96 and 300 dpi. In future versions, Adobe plans to transform TrueType fonts into Type 1 outlines.

The Distiller has an optional and somewhat obscure feature that allows a user to embed all Type 1 fonts or specify particular fonts to be embedded or not embedded.

When a PDF file is opened by Exchange or Reader, both applications will look for the document's font on the viewing system (and if it's a Type 1 font, they will look to see if it's embedded). If they can find the font, they use it. If they can't find it, the application uses the encapsulated descriptor and metric information to simulate the missing fonts using Adobe's



The ultimate goal of portable document exchange solutions is to provide a way to manage the electronic information onslaught.

Multiple Master technology. By simulating missing fonts, Acrobat can avoid having to embed fonts, which takes up a huge amount of space.

Multiple Master technology is not for everyone, however. It won't work for users who need to send an exact page replica, such as an ad agency that wants to send a new campaign to a client. These users can elect to use the Distiller product to embed whatever fonts they wish (if they have the proper licenses), but of course in doing so, they create larger files.

While its font handling is quite sophisticated, Acrobat has a search capability that is more limited than that of either of the other two packages. It allows you to search for a single word only (future versions, however, will allow full-text searches). Searching the package's help file alone is surprisingly slow. Compared with the other two programs, however, Acrobat offers the most advanced set of navigational features, including user-definable bookmarks and hypertext links. The bookmarks can be used to create a linked outline, allowing users to jump to the bookmarked page by dou-

ble-clicking on the bookmark icon. The links can bring the reader to another size view, page, or cropped view of a page.

Although you can't create navigational features within Acrobat Reader, you can use features that were put there with the Exchange program. Acrobat Reader allows users to view, navigate, search, and print PDF documents, and, unlike its fully featured cousin Exchange, it does not make or save changes. And because Reader does not include the PDF Writer driver, it does not enable you to create PDF files.

Adobe charges \$50 for a single copy of the Reader; lower prices are available for quantities. The product offers much more functionality than most viewers, and includes fonts and ATM with Multiple Master technology, but at a presumed street

price of \$25, it may prove to be a bit pricey for small companies.

And don't expect Acrobat to rest on its laurels. Adobe has many plans for this product, including adding more search capabilities, such as Boolean searches and searches on complex strings, keywords or database fields, and the ability to search through multiple documents. Adobe will also add the ability to use and work with SGML documents. Toward this end, Adobe has licensed technology from Avalanche Development, a leading vendor of SGML technology (now owned by Interleaf). Acrobat will use this technology to synchronize an SGML and an equivalent PDF file, creating an enriched file in which the SGML can be used for navigation. Extracting the SGML file while maintaining all of the original tagging information will also be possible.

Extensions will allow developers to access and incorporate PDF capabilities into their products. Imagine a communication program that would be designed to allow you to access and download specified pages of a large document, formatted on the fly by the host computer. In other

A little hard work never hurt anyone. A lot of hard work however is an entirely different story. Especially if we're talking about system printers. If they go down, the flow of information within your company can come to a grinding halt. Which means your business may come to a grinding halt.

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Portable Document Software

words, you would be able to access Acrobat documents from within other applications. The search and extension additions should be out in early 1994.

Due out at the end of this year are Unix Distiller and Exchange products for the Sun Solaris operating system, as well as a DOS Reader. The SGML-enhanced Acrobat is slated to ship later that year.

In addition to Acrobat's Distiller, Exchange, and Reader programs, Adobe will release an OCR program incorporating neural-recognition technology. This approach will allow the PDF format to maintain the formatting of a scanned document in addition to maintaining the text. Images will be compressed and stored, and the fonts will be recognized by the OCR program by comparing them with Adobe's Type Database. This module should be available by the middle of next year.

ONLY THE BEGINNING

As sophisticated as portable document technology is, software developers are already looking ahead. Adobe has spoken of providing PDF applications on a chip, as they have done with PostScript, which could be part of a whole new category of PDAs, specifically geared toward delivering publications. No Hands Software's Common Ground, presently only available on the Macintosh, will be available in a Windows version by the end of November. A joint development project with GO Corp. to deliver a Common Ground MiniViewer for the PenPoint personal communicators will enable users to view both Macintosh and Windows documents. Additionally, No Hands plans for Common Ground to support DOS, Newton, OS/2, and Unix operating systems in the future.

While future versions of portable document interchange products evolve to meet every user's electronic document needs, they are not the only products trying to do so. A myriad of different electronic formatting and viewing products are on the market today, and while they are presently directed at different market segments, they are all scrambling to add features and to become more versatile.

Although useful for many applications, the portable document approach has its drawbacks, and even the page metaphor on which these products are based could prove to be a hindrance in

some situations. Not many users have vertical (portrait) monitors that can display an entire full-size page. Scrolling up and down pages is certainly out of the question for users who plan to spend lots of time referencing very long documents.

Companies with voluminous amounts of information have already been using electronic delivery applications such as Electronic Book's DynaText, Folio Views, FrameMaker, Interleaf's WorldView, and others. While offering users elaborate search, hypertext, and indexing features, these applications are complex and are best implemented by specialists. These packages already offer many of the features that portable document interchange solutions have promised to add, such as SGML support, editable files, workgroup editing, and the ability to search multiple documents. Unlike portable document solutions that capture the entire page, electronic delivery software imports data—text, graphics, and charts—from other programs.

The ultimate goal behind the development of portable document exchange solutions is to provide a way to manage the expected electronic information onslaught. Today, you start from your operating system; from there you access any number of applications that allow you to calculate formulas, make charts, or write memos. In the near future, your home base is likely to be a document-viewing and navigation solution that can call upon the necessary tools needed to help you gather, format, and manipulate data elements extracted from other on-line documents and databases. □

► FACT FILE

Adobe Acrobat

Adobe Systems Inc., 1586 Charleston Road, P.O. Box 7900, Mountain View, CA 94039; 800-272-3623.

List price: *Acrobat Exchange*: \$195 (1 user); *Acrobat Reader*: \$50 (1 user) *Acrobat Distiller*: \$695 (1 user); *Acrobat Network Distiller*: \$2,495 (unlimited users).

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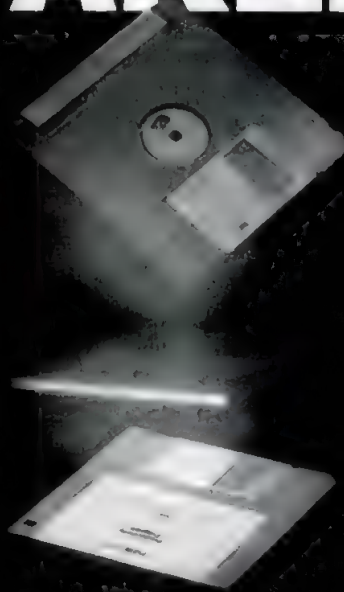
Replica for Windows, Version 1.0

Farallon Computing Inc., 2470 Mariner Square Loop, Alameda, CA 94501; 510-814-5000.

List price: \$99 (1 user); \$749 (10 users).

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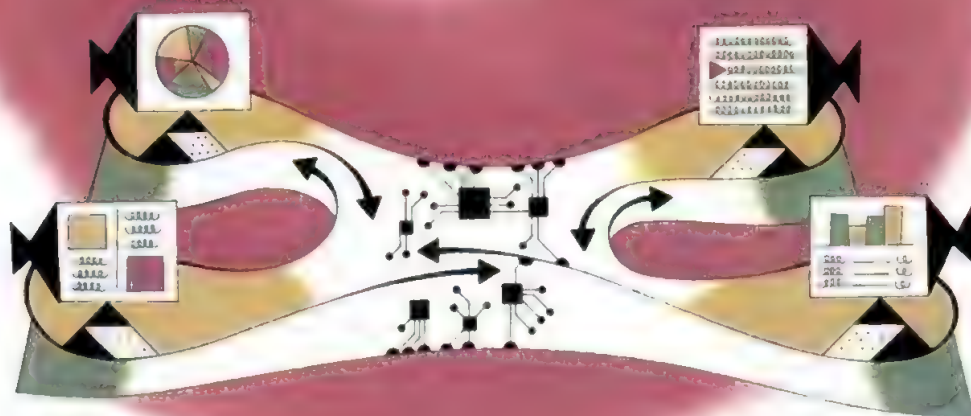
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Client/Server Databases

FRONT-END DEVELOPMENT TOOLS

SQL: Putting Up a Good Front



A new wave of graphical front-end development tools lets you build powerful, visually striking client applications for accessing server data.

by Sheryl Canter

Packaging is everything. In order for client/server databases to make it in the mainstream PC market, the client end of the equation—the end that people live with—has to make the grade. The server is only half the battle—and the invisible half at that. Even the most sophisticated SQL database back end counts for little if the front end can't present data exactly the way you want it.

Two issues ago we covered the server side of the client/server coin ("PC-Based SQL: Time to Commit?" October 12, 1993). In this story we look at the flip side: front-end development tools for building applications to query or update SQL data, generate reports, plot charts and graphs, and even perform statistical analysis.

All the tools we reviewed here are graphical, hosted on either Microsoft Windows or OS/2 and capable of generating GUI end-user applications. Today, as companies downsize SQL databases to the PC platform and harness desktop computers for data access, the cryptic, character-based applications of the main-

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frame era are a thing of the past.

With literally hundreds of tools on the market, front-end developers face a bewildering range of choices. With the increasing acceptance of ODBC (Open Database Connectivity), Microsoft's database-connectivity API, even simple spreadsheets and flat-file database products can talk to SQL databases. The capabilities of available tools run the gamut, from executing simple queries to empowering multiprogrammer development.

OUR REVIEW LINEUP

To select the products for this review, we asked each vendor covered in our SQL back-end database story—Gupta Corp., IBM Corp., Informix Software, Ingres Corp., Microsoft Corp., Oracle Corp., Sybase, and Watcom International Corp.—to recommend a front-end product of choice for development against their database servers. We also specified that each reviewed product must be a professional-level development tool with a full-featured scripting language for building application logic and creating a graphical user interface. Not surprisingly, most of the recommendations were for products developed and sold by the database vendors themselves. This was true for Gupta Corp., IBM, Informix, Ingres, Oracle, and Microsoft.

As we went to press, Sybase preannounced Build Momentum, a new GUI object-oriented development environment that the company will eventually port to most major client platforms. Initial

releases are expected in the first quarter of next year. For this review, however, Sybase recommended Visual Basic, Version 3.0, Professional Edition, as its preferred front-end access tool. Although Visual Basic contains numerous extensions for database access, it can't match the functionality of a dedicated front-end development tool. Accordingly, the Visual Basic review discusses a number of third-

THE CAPABILITIES OF AVAILABLE FRONT-END DEVELOPMENT TOOLS RUN THE GAMUT, FROM EXECUTING SIMPLE QUERIES TO EMPOWERING MULTIPROGRAMMER DEVELOPMENT.

party custom controls that can save you from writing significant amounts of code.

Watcom doesn't produce a high-end development tool for SQL access so it specified Powersoft's PowerBuilder for our tests. A standalone version of the Watcom database product is bundled with PowerBuilder. Version 3.0 of PowerBuilder was almost but not quite ready for release at the time of our story, and we reviewed Version 2.0 in last year's SQL front-end story ("SQL: The Sequel—Front-end Tools" September 29, 1992). Rather than review this version again, we tested Version 3.0 and preview it in the sidebar "PowerBuilder: Coming of Age."

Additional sidebars on two market-leading products, JYACC's JAM Client/Server Application Development Tools and KnowledgeWare's ObjectView

for Windows 2.1, help to fill out the front-end-tool picture, giving a glimpse of other approaches taken by third-party vendors. JAM is a Spartan yet powerful cross-platform environment hosted in DOS or Windows; its scripting language is for pros only. ObjectView, profiled in a late beta version, goes in the other direction, offering rich and intuitive graphical tools.

THE LOW END

Nonprogrammable front-end tools, which let end users graphically query SQL databases, produce reports, and generate graphs without writing code, are another important trend in SQL data access. Seven such nonprogrammable tools, from Brio Technology, Business Objects, Gupta, Informix, IntelligenceWare, Oracle, and Q+E Software are discussed in the companion article "SQL Access Simplified." Nonprogrammable front ends are built for end-user empowerment, allowing ordinary business users to do sophisticated ad hoc work with information stored in SQL databases.

TEST SPECIFICS

To put our lineup of programmable front-end packages to the test, we wrote a specification for an order-entry system for an imaginary company. We created a back-end database consisting of three linked tables—customers, orders, and products—and specified a variety of forms for each front-end tool to build against these tables. Our test forms included a security log-on screen, an order-entry screen, a QBF (Query By Form) search screen, an

H I G H L I G H T S

Power Tools for SQL Access

WHAT GOOD is a powerhouse SQL database engine if the people in your company can't access the data easily and make intelligent use of it? The tools in this roundup let developers write GUI applications specific to your business, so end users can update database records and generate reports and charts in a user-friendly, intuitive environment. Some even provide support for complex data-analysis and statistical functions.

FAST AND EASY SQL ACCESS is now claimed by a bargeful of packages. But for mission-critical applications, you'll need a full-fledged developer's tool that offers a powerful 4GL and the ability to call routines in other languages. Developers want to spend as little time coding the basics as possible, and these packages help by providing intuitive visual tools for building the user interface and other aspects of the app.

WHAT YOU NEED in an application will largely determine which tool you'll pick. Some excel at on-line transaction processing, while others are designed to build EIS/DS applications with sophisticated data-analysis features. You may also need an easy-to-use nonprogrammable SQL access tool for simple queries, reports, and generating charts. These tools are discussed in the companion story "SQL Access Simplified," also in this issue.



EDITORS' CHOICE

• Holding Off for Now

inventory-control screen, and a sales book that showed data from two of the tables simultaneously. Forms had to be selectable from a menu, and permissions were assigned to each form to keep unauthorized users out. We also specified that each product generate one of two charts: Floating-bar or high-low-close. Representatives from each company spent an allowed maximum of two and a half days at PC Magazine Labs, working with our reviewers in coding the test applications. (For full testing details, see the "How We Tested" sidebar.)

The two products that completed our test script most quickly and easily were Gupta SQLWindows, Version 4.0, Corporate Edition, and Powersoft's PowerBuilder, Version 3.0. Because of their rich, built-in functionality, minimal coding was necessary to build our application. Most of the other products reviewed were unable to complete the script in the allotted time because of the larger amount of coding required, but they completed enough for us to judge their capabilities.

TYPICAL FRONT ENDS

There are two primary uses for SQL front ends: OLTP (on-line transaction processing) and EIS/DS (executive information systems/decision support). With OLTP applications, you are simply using the front end to update the database. EIS/DS applications access the data in ways that turn it into information used as the basis for business decisions. The requirements for the two types of applications are very different.

Writing an OLTP front end typically demands only basic functionality from the development environment. The most important requirement is the package's ability to create a stable application. Whenever you are updating a mission-critical database, you must rely on the application's ability to operate correctly and not crash the system.

Our Contributors: JOE SALEMI is a contributing editor to *PC Magazine*. RON ANDERSON is a frequent contributor to *PC Magazine*. BRIAN BUTLER is president of Client/Server Solutions, a firm specializing in application development and database performance. SHERYL CANTER is an independent software developer and frequent contributor to *PC Magazine*. GABRIELLE GAGNON is a systems consultant for the Dreyfus Corp. STEPHEN W. PLAIN is a frequent contributor to *PC Magazine*. THOMAS MACE was the associate editor in charge of this story, and JAY MUNRO was the project leader.

Despite the high quality of some products in this lineup, this is the wrong time to pick an Editors' Choice. A number of these packages are about to appear in major new releases—in some cases by the time this issue hits the newsstands. The SQL front-end landscape is changing

too quickly for a definitive judgment.

Still, an honorable mention goes to the Corporate Edition of Gupta SQLWindows, Version 4.0, a feature-rich product that flew through our tests. Its intuitive visual tools, full DDE and OLE support, object-oriented programming constructs, and broad back-end connectivity are just highlights of this impressive environment. Its only significant downsides are nonexistent client portability—SQLWindows runs under Microsoft Windows only—and lack of built-in charting.

IBM Personal AS/2 and IBM Personal AS Builder/2, both in Version 3, performed well during testing and deserve serious consideration for OS/2 development. Their only real drawbacks are slow performance in

EIS/DS development poses much more complex requirements. You need to create SQL queries flexibly and easily, pulling up all records that meet specific requirements—all customers in a given zip code showing a negative balance, for example. A good report writer with strong formatting capabilities is also critical. Support for graphing is a plus, and some applications also require statistical-analysis functions.

Of all the products tested, only Ingres/Windows 4GL for OS/2, Version 2.0, raised some concerns about stability. But many of

their interpreted environment and, again, lack of portability.

Powersoft Corp.'s very impressive PowerBuilder 3.0 was still in beta as we went to press, but this tool holds every promise of being a front runner among Windows front-end development tools.

Oracle Corp.'s strong CDE suite of tools was also not fully complete at press time; we tested one of its four components, Oracle Forms 4.0, in beta. By the end of the year, Oracle's aggressive cross-platform strategy should earn CDE serious consideration for cross-platform work. Informix Hyperscript Tools 1.0, for Informix Software databases only, also offers a strong visual tool set and a future vision of cross-platform compatibility.

the products lacked critical features for decision-support systems. In fact, EIS/DS features are more commonly found in non-programmable front-end tools.

Not all the products we reviewed support business graphics and charting. IBM Personal AS/2 (PAS/2) 3.0, Oracle Cooperative Development Environment (CDE), and PowerBuilder have the most complete charting support, providing templates for a variety of different types of graphs. Ingres/Windows 4GL supports only primitive line and bar charts. Gupta SQLWindows 4.0 lacks built-in charting entirely, but its strong DDE (Dynamic Data Exchange) and OLE (Object Linking and Embedding) capabilities let you pipe data into a charting application.

Similarly, not all the packages contain a report writer, and the ones we saw were not always as tightly integrated as they could be. The Professional Edition of

APPLICATIONS DEVELOPMENT

Front-End Development Tools

Suitability to Task: SQL Front-end Development Tools

The abilities of products in this category vary widely, and trade-offs may be necessary. Since one product won't do it all, it's crucial to select a package suited to your intended tasks.

Custom application development—building applications to meet virtually any need—is the broadest test of a front-end tool's power. Products scoring well offer rich scripting languages, a capable debugger, and the ability to call 3GL libraries. The best provide a rich set of user interface objects and the ability to create new ones, multiple bitmapped and back-end data formats, and sophisticated features such as DDE and OLE.

When building **EIS/DS applications**, you need tools for turning raw data into usable information. The best packages have a variety of charting options, a strong report writer, a menu-driven query builder, and end-user support for QBF. A strong set of statistical functions will boost this score.

Fast application development is often important. Developer conveniences that allow rapid prototyping and shorten the development cycle include a

SUITABILITY TO TASK				
Product Name	POOR	FAIR	GOOD	EXCELLENT
Custom application development	●	○	○	○
EIS/DS applications	●	●	○	○
Fast application development	●	●	●	○
Cross-platform development	●	●	●	●

visual interface designer and GUI report writer, a rich set of built-in graph types and form templates, automatic form generation, and a menu-driven query builder that lets you view and modify the generated SQL statements. The ability to perform standalone development without a network connection can also shorten development time.

In the heterogeneous world of SQL databases, a **cross-platform development** strategy can be crucial. Suitable packages can produce applications that run on multiple operating systems without modification of the source code. The best avoid a least-common-denominator approach by internally providing support for features that a particular host operating system lacks. Ideally, cross-platform packages should be cross-database as well, supporting multiple back ends through ODBC or another API.

and then using the mouse to place and size the objects on the form.

Once the interface is done, the next step is to write code to make it perform useful functions. In most cases, the tools use an event-driven programming model where events—clicking on a button or selecting a menu item—drive program execution.

ALTHOUGH ALL OF THE TESTED PRODUCTS ARE GRAPHICAL, NONE REQUIRES YOU TO WRITE DIRECTLY TO THE WINDOWS OR OS/2 PRESENTATION MANAGER APIs.

The scripting languages used by most front-end development tools are generally referred to as 4GLs (fourth-generation languages). This slippery term refers to specialized languages that encapsulate high-level functionality in a shorthand command syntax. This is in contrast to 3GLs such as C or Pascal, whose low-level flexibility makes them appropriate for general-purpose development. In terms

of syntax, the scripting languages used by most of the products resemble BASIC. But some, such as Gupta SQLWindows and particularly Ingres/Windows 4GL, use constructs that more closely resemble C. All of the tested products can call modules written in a 3GL.

Three of the products—Gupta SQLWindows, Ingres/Windows 4GL, and Oracle CDE—also support object-oriented features in their scripting languages, features such as single and multiple inheritance, and polymorphism. Such features can make team development run more smoothly, letting you break projects into discrete components on which separate programmers can work.

MULTIPROGRAMMER FEATURES

Because many front-end applications are built by teams of developers, built-in team development features such as check-in, check-out, and version control are especially valuable. Gupta SQLWindows (via a bundled add-on) and Ingres/Windows 4GL provide strong team development support.

Check-in and check-out are means for tracking and controlling who has access to program modules. When a programmer brings up an application component for editing, it's checked out under his or her name, and no one else can work on it until it's checked in again. Ingres/Windows 4GL lets you save components privately, so that no one but you can see them.

When developing a network product such as a SQL data access tool, it's a big convenience to work off-line, not connected to a network. This isn't possible unless a standalone version of the database engine is provided for the front-end tool to connect to. Of the products tested, only Gupta SQLWindows and PowerBuilder provide this capability. Though you cannot perform full standalone development with Oracle CDE, some of its features can be accessed without connecting to a database.

CROSS-PLATFORM TRADE-OFFS

Cross-platform capability is an issue that looms large in SQL database front-end development. SQL databases, typically the repository of a company's most critical data, are often sprawled across physi-

Microsoft Visual Basic for Windows 3.0 includes Crystal Reports 2.0, a powerful GUI report writer, but it is only partially integrated with the core product. PowerBuilder 2.0 has poor report-writing support, but Version 3.0 boasts significant enhancements. Ingres/Windows 4GL also does not have a report writer in the current version, but the company is working on one for the next release.

Only a few of the packages we reviewed have built-in statistical capabilities, another important feature for decision-support systems. PAS/2 and Visual Basic, with their strong suite of mathematical functions, are the standouts here.

EASY CODING

Although all of the tested products are graphical, none requires you to write directly to the Windows or OS/2 Presentation Manager APIs and all contain visual tools for designing the user interface. Development generally begins with the creation of a form. You add interface objects by clicking on a toolbox



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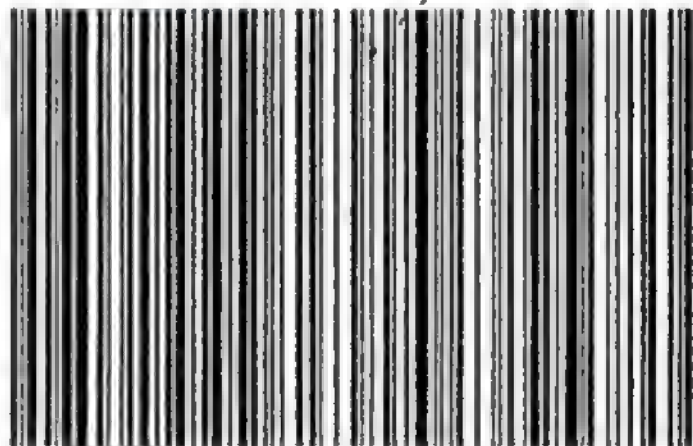


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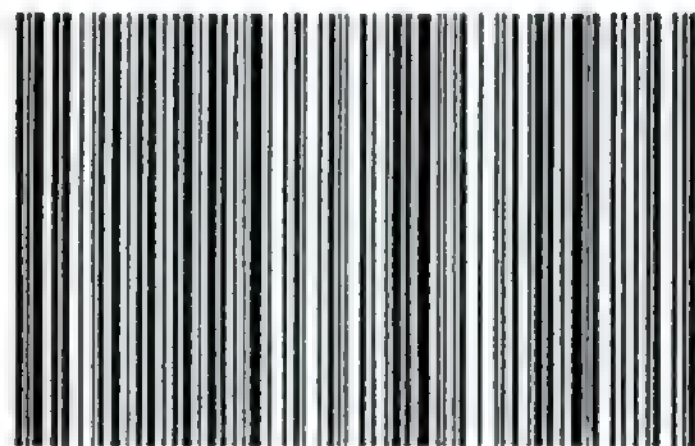
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Foldout slip-sheet

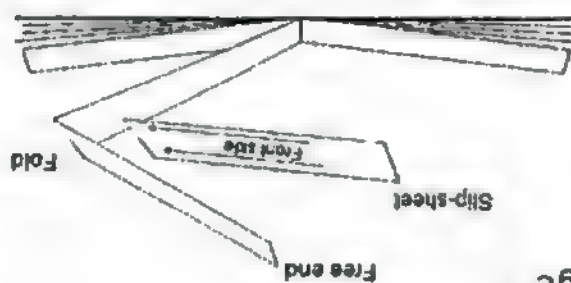
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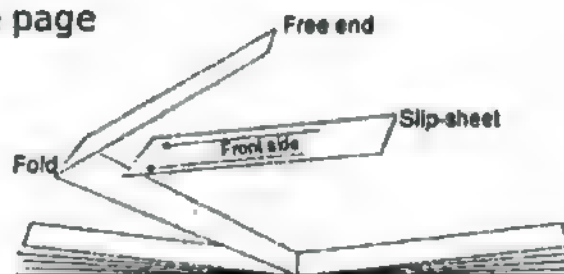
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4. Close the page and slip-sheet



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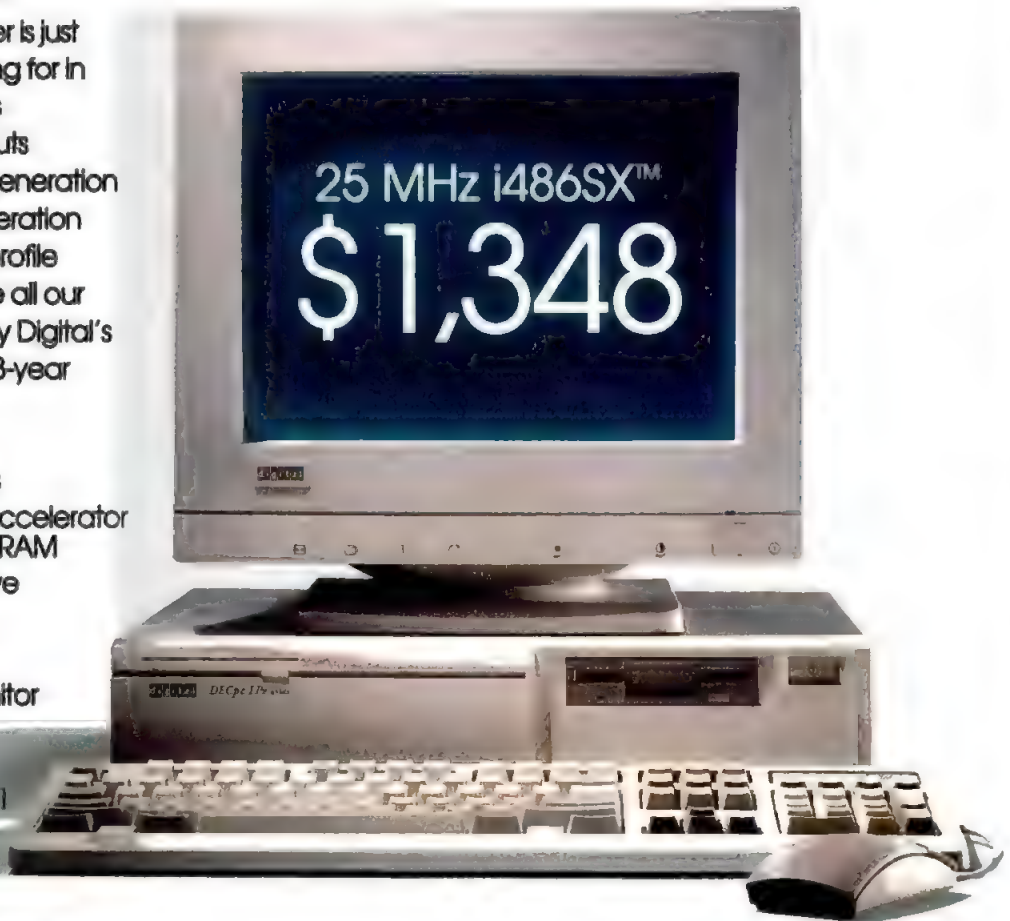


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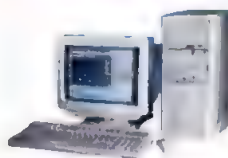


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Performance Tests: SQL Front-End Development Tools

To test this story's GUI programmable front-end development tools, we focused on suitability to task rather than performance. This let us evaluate how well each product could handle a real-world development task. Front-end speed does vary among products, but is heavily dependent on the performance of the connected back-end SQL database.

How We Tested

To uncover the capabilities and weaknesses of each product, we created a specification for a generic business application that incorporates a wide range of typical front-end functionality. We then put each product through its paces, working with vendor representatives to implement the spec.

We defined seven screens typical of those used by data entry workers: Security/log-on, main menu, add customer, find and modify customer, add product, product maintenance, and sales book. This last screen is a complex two-part multiple-document interface screen displaying a composite record and view. We then prototyped the specification in Microsoft Visual Basic to serve as a guideline for labs testing.

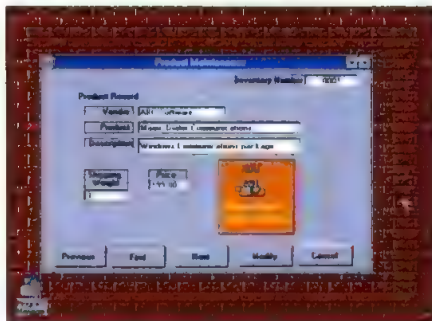
Testing was conducted at PC Magazine Labs by our reviewers and a team sent by each of the participating vendors. Each vendor was allotted two and a half days to complete as much of the test script as possible. Vendors were provided with a copy of the specification and script several weeks in advance for review and preparation. Several actually built the application ahead of time, but all were required to re-create it from scratch in our labs in the presence of the reviewer.

The back-end database we used consisted of three tables: customers, products, and sales. A variety of data types were represented, including double-precision floating-point, date, integer, fixed-length character string, variable-length character string, and BLOB (binary large object).

Applications were developed on a Compaq Deskpro 486/33M with 8MB of RAM (OS/2-hosted products required 16MB and Oracle required 12MB). We allowed each vendor to specify a network connection and SQL back-end server of choice. Each product also had to create the database tables and import our comma-delimited test data.

TEST SCENARIO

Testing started with the creation of a password-protected log-on screen. Our test application required that certain screens be available only to users with a specific access level while giving the database administrator access to all screens. In addition to standard input and custom fields, the app tested each product's support for GUI objects such as list boxes, buttons, and child windows.



Our prototype product maintenance screen included a self-incrementing field and a BLOB image field.

To test the ability of each package to call 3GL modules (which are typically used to provide custom functions to an application), we provided DLLs that calculate the sales tax amount and shipping costs for a hypothetical order.

To test EIS/DS features, we asked for two reports from our sales data. The first was a single-pass report, requiring data that could be gathered from the database without intermediary calculation. The second, a two-pass report, required the program to scan once through the data to calculate the average sales for a given month, then go back and compare each sale with this average. The report had to be formatted to highlight the results, based on whether the monthly average was above or below the last year's average for that product.

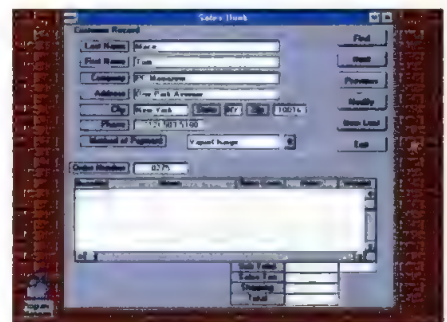
Our application also tested the graphing capabilities of the products by asking for a high-low-close chart, showing the high, low, and average sales plotted over a year. If the package could not handle that style, vendors were allowed to substitute a floating-bar or stacked-bar chart instead, though the Gupta product does not support charting at all.

HOW THEY FARED

All of the tested packages were able to create the specified screens using their built-in GUI painters (Ingres required a second step to add color), and all the packages were able to create pull-down menus with accelerator keys. All were also able to handle the three BLOB images in our test app, although the storage method used for the bitmaps or BLOBs varied.

The test script called for a number of specialized field types. Vendors implemented the self-incrementing Customer Number field we asked for in several ways. Oracle called a back-end function, while Ingres and Informix produced it via the front end. All the other vendors needed to write code to achieve the same functionality. With the formatted fields, Gupta, Ingres, Oracle, and Visual Basic each provided a built-in facility to implement them, while IBM, Informix, and Ingres needed to write code.

To support data entry, searching, and updating, the applications needed to create appropriate SQL statements. Gupta, Informix, and Oracle provided visual tools that eliminated most coding, while IBM, Ingres, and Visual Basic required more extensive coding.



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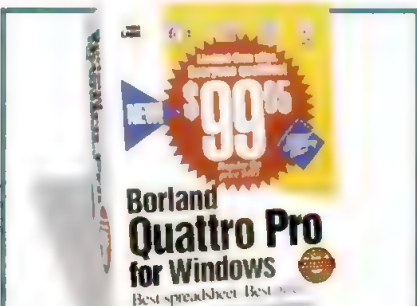
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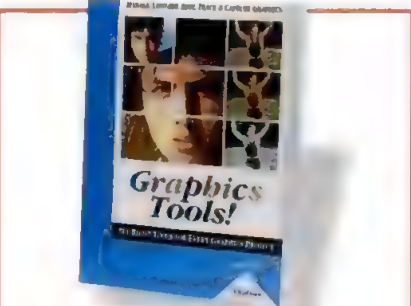
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4402	Harvard Graphics 2.0 for Windows (4403 5 1/2")		269

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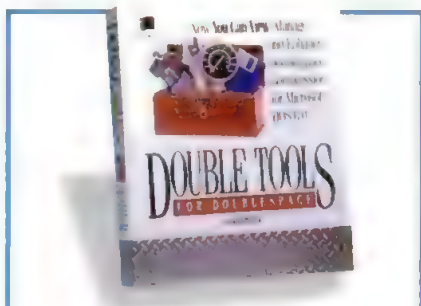
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12029	DoubleTools		65.
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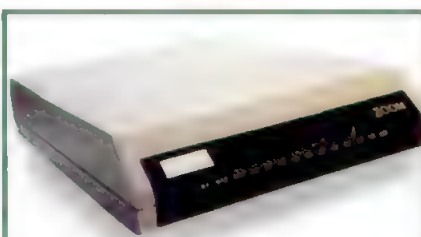
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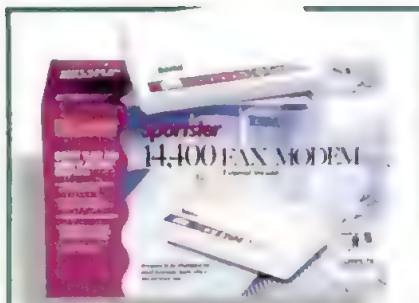
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7809 BJ-200 BubbleJet Printer 315. 12547 BJ-230 419.

CoStar ... 1 year

1814 LabelWriter II Plus..... 239.

Epson ... 2 years

5555 AP-3250 (80 col., 200 cps, 24 pin)..... 199.
11800 LQ570+ (80 col., 269 cps)..... 269.
10784 Action Laser 1500 (1 MB)..... 789.
11495 Stylus 800... 369. 10784 ActionLaser 1500... 789.

Hewlett-Packard ... 1 year

12212 LaserJet 4L (with toner)..... 729.
7620 DeskJet 550C 669. 7621 DeskJet Portable 439.
6442 LaserJet 4 (with toner)..... 1499.

Kensington Microware ... 1 year

7899 Expert Mouse 4.0 (Serial)..... 99. 7900 (Bus)..... 115.

Key Tronic ... 3 years

6864 Flash101 Keyboard 44. 4518 101 Plus Keyboard 99.

Logitech ... limited lifetime

3996 Trackman2 (combo)..... 79. 2343 Portable..... 99.
3295 Mouseman (combo)..... 69. 9766 (cordless)..... 89.
7975 ScanMan256 179. 2468 w/OminiPage Direct 225.

Microsoft ... lifetime

7597 Microsoft Serial Mouse 69. 1896 Ballpoint Mouse 79.
2898 Mouse with Windows 3.1 (serial)..... 145.

MicroSpeed ... 1 year

6007 PC-TRAC Trackball 59. 11222 KB101 Keyboard 40.

Microtek ... 1 year

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11859 ScanMaker II with Transparency..... 1449.

Mouse Systems ... lifetime

7878 PC Mouse III (serial)..... 69. 9082 MouseI..... 19.

Mustek ... 1 year

8452 Gray Artist for Windows (256 GS hand scanner) 165.
Okidata ... 1 year

6174 OL400E Laser Printer 549. 9590 OL810 Laser. 969.

11901 OL830 Plus..... 1149. 11893 OL850..... 1279.

Pacific Data ... 60 day MBG

5729 ProTracer (with HPGL emulation) (1 yr.)..... 1849.



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American Power ... 2 years

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7107 Back-UPS 450... 215. 7105 Smart-UPS 600 439.

Curtis ... lifetime

7654 Command Center Plus..... 84.

Intel ... 3 years

4750 80387SX..... 79. 5409 80387DX..... 85.

Kensington Microware ... 1 year

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2582 MasterPiece Plus..... 95. 2587 Remote..... 105.

PC Power & Cooling ... 2 years

9537 CPU Cooler (for 386/33 up to 486)..... 29.

3203 Turbo Cool 200... 149. 7915 Turbo Cool 300... 159.

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7369 Notepad 35. 1305 Univ. Notebook Computer Case 69.

Tripp Lite ... 2 years

6199 Isobar 4-6..... 43. 6200 Isobar 6-6..... 49.

5550 BC250 Battery Backup... 119. 9312 BC500... 219.

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Colorado Memory Systems ... 1 year

4354 Jumbo 250 Tape Backup..... 179.

1073 Tracker 250 Tape Backup (parallel)..... 349.

Conner Peripherals ... 1 year

2339 CP30104H 120 MB IDE HD (19 ms)..... 199.

1337 CP30204 210 MB IDE HD (18 ms)..... 256.

Iomega ... 1 year

6499 Transportable 90 PRO..... 479.

10452 Transportable MultiDisk 150..... 559.

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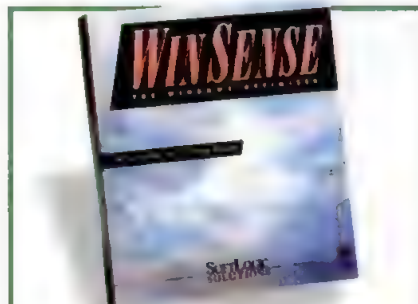
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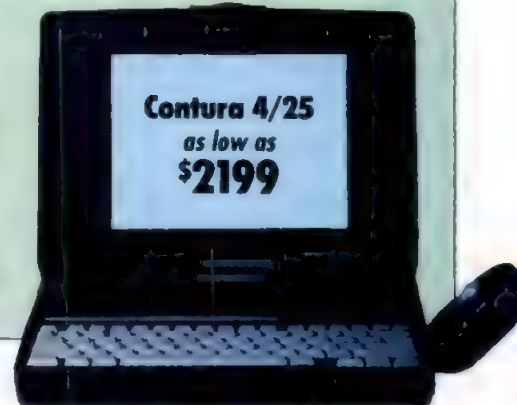
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cal locations and even across operating systems. Similarly, the front ends that access them may be running on Windows machines, OS/2, or even Unix.

Some vendors—notably Informix, Ingres, and Oracle—adopted a cross-platform approach, where finished applications are portable across several client platforms that can include Windows, Macintosh, OS/2, and Motif. But this adaptability comes at a price. The easiest way to implement cross-platform portability is to take a least-common-denominator approach, which can lock you out of special features on any of the platforms. All the cross-platform tools we looked at suffered from this to some extent. Often, the number of interface objects and bitmap formats is limited, and advanced features such as DDE and OLE are not supported.

Two of the cross-platform tools we looked at—those from Ingres and Informix—are also back-end-specific; they can connect only to the company's own SQL engine because they use their own proprietary APIs. Ironically, the strongest back-end connectivity was found among products with limited or nonexistent client portability. For example, Gupta SQLWindows—a Windows-only front-end tool—excels at broad back-end support.

If a product lacks native support for a variety of back-end servers, ODBC can provide an alternative. ODBC is a Microsoft-promoted API for linking SQL front ends and back ends, regardless of the native format. ODBC drivers on the client convert ODBC calls from the front-end application into engine-specific dialects. The only reviewed products with ODBC support are Visual Basic and the beta release of PowerBuilder. Ingres/Windows 4GL supports ODBC in its Windows version but not in the OS/2 product we reviewed. Both Informix and Oracle plan to add ODBC support to the upcoming releases of their products.

Standardized APIs such as ODBC can also involve trade-offs. If you talk to a database engine in its own proprietary API, you will be able to access every feature of that engine, including significant special features other vendors don't support. The bottom line is, if you want to communicate with more than one SQL database or run your front-end application on more than

more operating system, you'll be forced into some significant compromises.

FEATURES, NOT PRICE

When calculating the deployment cost for any of the reviewed front-end development tools, you can't help but notice the striking price differences among them. At the high end, PowerBuilder retails for a hefty \$3,595, and the \$3,495 Gupta SQLWindows is close behind. At the opposite end of the spectrum, Visual Basic retails for a modest \$495. And remember that prices for runtime distribution modules and client connections can complicate the picture further.

With the wide variations in power, usability, suitability to task, and cross-platform support among the tools reviewed, price may not be a primary consideration for a corporate buying decision. The reviews that follow will give you the details you need to make an informed choice.

Gupta Corp.

Gupta SQLWindows, Corporate Edition

BY RON ANDERSON

Gupta SQLWindows, Version 4.0, is a feature-rich, mature SQL front-end tool for developing visually stunning Microsoft Windows database applications. Intended for Windows-only development work, this package ranks among the best. SQLWindows is available in two flavors: the Standard Edition (\$1,995) and the Corporate Edition (\$3,495).

The Standard Edition includes the complete development environment and a local, single-user Gupta SQLBase database engine. With the local engine, you can test and debug your applications before moving them to a test or production server. The Corporate Edition ups the ante with two add-ons: Quest and TeamWindows. Quest is a powerful end-user query tool used for prototyping and some development work

(for an in-depth look at Quest, see the review in the companion story "SQL Access Simplified" in this issue). TeamWindows is a strong multideveloper and version-control package that enables you to track and control your projects from initial assignments to the final production release. For a multiprogrammer shop, just the addition of TeamWindows to the Corporate Edition is worth the price hike.

MATURE PRODUCT

The first version of SQLWindows shipped in 1988. The current release (Version 4.0) demonstrates Gupta Corp.'s significant investment of time and effort. Gupta has also been shipping SQLBase, a well-regarded SQL RDBMS (relational database management system) back-end product, since 1986. (For a review of SQLBase, see our issue of October 12, 1993.) SQLBase is hosted on numerous PC-based operating systems, from DOS to Unix.

If you are already familiar with C and the Windows SDK, then you will feel at home with SQLWindows' syntax and its mixed-case, case-sensitive statements. Others will need to take advantage of the generous on-line help facilities to get the syntax just right. The on-line help in SQLWindows is so complete that you may never need to consult the numerous manuals supplied.

At start-up, SQLWindows displays the Outline window, the Form window, and the Tool palette. The first and most important hurdle on the SQLWindows learning curve is getting intimate with the

Outline window, since it is here that you'll spend most of your development time. While you will use graphical tools to draw and edit your forms (adding fields, labels, and buttons), ultimately

all of these objects and your application code will exist as items in the Outline. The Outline view of your application can be abstract and somewhat difficult to navigate through at first, but familiarity will breed respect for the Outline's logical and consistent interface.

SUITABILITY TO TASK				
Gupta SQLWindows				
	POOR	FAIR	GOOD	EXCELLENT
Custom application development	●	●	●	●
EIS/DS applications	●	●	●	○
Fast application development	●	●	●	●
Cross-platform development	●	●	○	○

Front-End Development Tools

DATA AND REPORTS

Database applications need to display and interact with tables of data gleaned from the RDBMS. SQLWindows includes an additional window type—a Table window—that is dedicated to dealing with rows and columns of data. The Table window's functions include insert, delete, and update, so most of the data-manipulation logic needed for a database application is provided for you. This can significantly reduce the development time for SQL applications. The Table window also supplies a simple method for providing data to your reports.

SQLWindows generates reports at runtime via report templates. Gupta provides two tools, Quest and ReportWindows, that let you design your report templates visually during your application's development cycle. Both show the GUI inter-

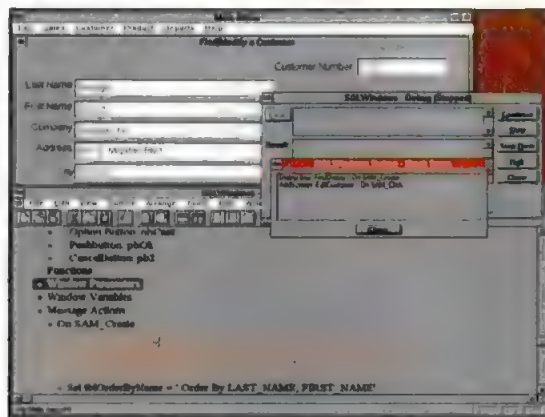
face at its best, letting you click and create a detail line here or drag a column total there. By far the easiest way to generate a report is to design the report template using Quest, and then use the built-in Table window functions to display or print the report from the contents of the Table window. Using this method, we created the test application's monthly account reports in less than an hour. SQLWindows is also able to create report templates on the fly at runtime for quick-and-dirty information or when you need flexibility. SQLWindows does not currently support charting.

The only real frustration we encountered using SQLWindows was the case-sensitive pickiness of the SQLWindows Application Language (SAL), coupled with a lack of on-the-fly syntax checking and correction. For example, when we typed "saldragdropgetsource" and we really meant "SalDragDropGetSource", SQLWindows forced us to find and correct the problem manually.

OBJECT SUPPORT

Like many current high-end Windows development environments, SQLWindows provides full support for Windows drag and drop, DDE and OLE (client and server), custom controls, and

user-defined functions in external dynamic link libraries (DLLs). It also goes a step further by providing object-oriented programming (OOP) constructs that include classes with single or multiple inheritance. Base classes can be created for any user-defined SQLWindows object. Additional



With Gupta SQLWindows, it's easy for developers to create visually stunning custom applications. The one drawback is that it's for Microsoft Windows development only.

classes can be derived from one base class (single inheritance) or more than one base class (multiple inheritance).

Application look-and-feel and maintainability are greatly enhanced through SQLWindow's OOP. Changes to a base class automatically cascade through your application to all derived classes. Likewise, altering the appearance or functionality of a class object makes the corresponding changes to all instances of that object in your application.

DEBUGGING AND COMPILING

SQLWindows' industrial-strength debugger is integrated into the development environment and provides application step and trace, multiple breakpoints, and an interactive debug window where you can evaluate expressions and variables on the fly. User-defined variable and procedural watchpoints are missing, but even without the aid of watchpoints, the debugging facility is very functional.

Applications created with SQLWindows compile to executables that require Gupta's runtime module. Keeping in line with industry trends, Gupta has recently dropped the \$90 application registration fee, so runtime distribution doesn't cost a cent.

Although Gupta has its own SQL

RDBMS back-end product, back-end support in SQLWindows is far from limited. In addition to native, out-of-the-box support for SQLBase and non-SQL file formats including ASCII, dBASE, Lotus 1-2-3, Microsoft Excel, and Paradox, SQLWindows applications can connect to IBM AS 400, IBM DB2 and IBM DB2/2, Informix servers, Ingres Server, Oracle servers, and Sybase SQL Server through optional SQLRouters from Gupta (priced from \$100 to \$250 per client, based on volume). Additionally, Cincom Supra, EDA/SQL, HP-Allbase, and HP TurboImage can be accessed through third-party routers.

WINDOWS ONLY—FOR NOW

SQLWindows has limited appeal for enterprise-wide networks that host a variety of front-end clients. With SQLWindows, it's Windows or nothing. Gupta is working on a Windows NT product (due in the fourth quarter of 1993) and has long-term plans for Macintosh, OS/2 Presentation Manager, and Unix clients.

If your needs are immediate and your client operating systems are many, SQLWindows probably won't fill the bill for your organization. But if you work in a Windows-only shop and need a SQL application development tool that is full-fea-

FACT FILE

Gupta SQLWindows, Version 4.0, Corporate Edition

Gupta Corp., 1060 Marsh Rd., Menlo Park, CA 94025; 800-876-3267, 415-321-9500; fax, 415-321-5471



List price: \$3,495

Requires: 386-based PC or better, 4MB RAM (8MB recommended), 15MB hard disk space,

Microsoft Windows 3.1.

In short: A robust, Windows-only SQL applications-development environment that is among the best in its class. SQLWindows is standards-based, open, well conceived and implemented, and certain to reduce the development time for your database applications.

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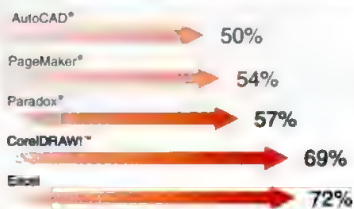
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tured and adheres to Windows programming conventions, SQLWindows is well worth evaluating. Ultimately, we found that no task presented by the test application was too great for SQLWindows to accomplish. In fact, there were usually multiple solutions that took our application to the same destination.

IBM Corp.

IBM Personal AS/2

IBM Personal AS Builder/2

BY GABRIELLE GAGNON

IBM Personal AS/2 and IBM Personal AS Builder/2, both in Version 3, are the latest additions to IBM Corp.'s family of Application System (AS) decision-support tools. Touted as the PC complement to IBM's mainframe package, AS for S/390, the Personal AS line was introduced with the original OS/2 back in 1987. It featured the foundation product plus a suite of options for project management, statistical analysis, business planning, and application development.

As the 32-bit successors to PAS/2, Version 2, and its Development/2 option, Version 3 of PAS/2 and PAS Builder/2 are the only 32-bit packages presently available. They offer an impressive array of tools for developing queries, charts, reports, and decision-support applications. Their only real weakness in this arena is somewhat sluggish performance.

PAS/2: SMOOTH BUT SPECIALIZED

The core product, Personal AS/2, is an interpreted, object-oriented environment, tightly coupled with OS/2's Workplace Shell (WPS). PAS/2 provides objects for tables, queries, reports, charts, commands, and procedures, which can be placed anywhere on the desktop and manipulated like other WPS objects. The result is a highly intuitive interface and a smooth learning curve for OS/2 users.

For example, if you want to generate a new table, you drag a PAS/2 Table template from the Templates folder to the

desktop; if you want to delete the table, drag it to the Shredder. Also, PAS/2 makes extensive use of OS/2 Presentation Manager's DDE rendering mechanism: To link a table to a report, you just drag



The array of charting and reporting tools included in IBM Personal AS/2 is impressive. There's a variety of chart types available, and you can add locally calculated fields and perform data-analysis functions in all of them.

the table object to the report object and drop it, and a DDE dynamic link is set up between them. If you make any changes to data in the table, the report is automatically updated. (If you don't want automatic updates, take a snapshot of the data and link that to the report instead.)

Since PAS/2 was originally designed to work in tandem with its mainframe counterpart, AS for S/390, it's not surprising that its back-end support is somewhat specialized. Direct communications with a host AS system running VM or MVS can be made using the OS/2 Communications Man-

ager. The Command object allows you to trigger host AS command procedures on the mainframe and

exchange procedure command tables between the mainframe and PC. In addition to host AS systems, PAS/2 can also exchange files directly with the AS/400 system. Otherwise, the only external databases directly supported are dBASE and IBM DB2/2.

Gateways extend its range somewhat. Using IBM's DDCCS/2 for DB2/2, PAS/2 can access SQL/DS, SQL/400, and DB2;

the TechGnosis SQL Link gateway allows it to front-end Ingres, Oracle, Sybase, and XDB servers. PAS/2 also supports Information Builder's EDA/SQL. If none of these back-end options suit you, you can always use PAS/2's proprietary database engine.

REPORTS, CHARTS, AND QUERIES

Getting to the data is only part of the story, however; it's what you do with it that counts, and that's where PAS/2 shines. Even without its add-on analysis packages, PAS/2's array of charting and reporting tools is impressive. It offers rotating, 3-D, and exploding pie charts; scatter, area, and mixed multidimensional charts; and all the standard bar and line graphs. You can add locally calculated fields and perform data analysis functions in all of them.

Reports include detail and summary-level columnar reports, mailing labels that can be rotated, crosstabs, and forms. As with charts, you can generate locally calculated fields and use analysis functions. Both the chart and report objects may

FACT FILE

IBM Personal AS/2, Version 3

IBM Personal AS Builder/2, Version 3

IBM Corp., Dept. AD5, 5 W. Kirkwood, Roanoke, TX 76299-0001; 800-426-2255

List price: PAS/2, \$825 (single-user); Builder/2, \$2,500.

Requires: 386-based PC or better (486 recommended), 16MB RAM (includes OS/2 requirements), 10MB hard disk space (additional 2.5MB for Builder/2), OS/2 2.1.



In short: Ideal decision-support environments for the OS/2 platform. IBM Personal AS/2 and IBM Personal AS Builder/2 are terrific for application developers who need to build OS/2 applications. The products feature tight integration with the operating system and the Workplace Shell, and offer unsurpassed charting and analysis features. The only drawback is their relatively sluggish performance.

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September 14, 1991
Nanao FlexScan F-550W

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FlexScan F-550s

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act as either a DDE client or server and can output results in a variety of graphical and text formats. Our only complaint is that PAS/2 does not support any of the spreadsheet formats—an odd omission for an otherwise comprehensive DDE package.

The Query tool is equally impressive and very easy to use. A Query object represents a result set, and complex queries may be constructed by dragging multiple

Table and Query objects onto another Query object (opening a Query object displays a diagram of all of the relationships it contains). Once the data is linked, you construct the actual query through a series of dialog boxes. PAS/2 supports the full complement of SQL syntax, including outer joins.

If all of this sounds overwhelming, don't worry. PAS/2 is geared toward business users, not programmers, and the

documentation contains excellent tutorials for all of its features.

BUILDER/2: EXTRA MUSCLE

While PAS/2 supplies most of what any power user could hope for, there will be times when you may need to customize the system. PAS/2 comes with a visual programming tool for nonprogrammers that takes care of automating simple procedures, but more complex tasks

▪ **JAM:** *Austere Portability*

by Gabrielle Gagnon

JAM Client/Server Application Development Tools is a powerful, no-frills development suite designed for hard-core pros. Its Spartan interface lacks GUI niceties, but those willing to put in the effort will find it a very capable tool. Best known for its Unix tools, JYACC's Microsoft Windows product is the company's most recent offering. JAM also supports over 20 database back-end servers.

JYACC separately markets each development component (interface builder, database access module, report writer, transaction-processing module, and so on), so each customer can mix and match functionality for the chosen platform or database. We looked at JAM/Data-base interface (JAM/DBi) Sybase for DOS, Version 5.10; JAM/Presentation interface (JAM/Pi) for DOS, Version 5.04e; JAM/Presentation interface (JAM/Pi) for Windows, Version 1.5; and JAM/ReportWriter for DOS, Version 5.1.

The core product consists of an event-driven scripting language, a screen editor, a data dictionary, and utilities that work with JAM's add-on interface libraries.

PORTABILITY AT A PRICE

The premise behind JAM is to let developers write application on any of the JAM platforms and port them to any other without recoding. JYACC

accomplishes this by providing an interpreted environment with its own proprietary scripting language, JPL. JPL code calls functions from the platform-specific JAM interface libraries, and the interfaces map these calls to their operating environments. To port an application, you simply re-link to a different interface library.

To make this practical, JAM has taken somewhat of a lowest-common-denominator approach. To get the most out of the environment, you will have to sacrifice some portability and call external routines. Fortunately, JPL lets you

JYACC MARKETS EACH DEVELOPMENT COMPONENT SEPARATELY SO YOU CAN MIX AND MATCH FUNCTIONALITY FOR YOUR PLATFORM OR DATABASE.

freely interact with other languages.

By far the strongest component of the tool set is the data dictionary, a central repository for fields and global variables. Field characteristics such as formatting and data validation are administered through the data-dictionary editor, but you may also use it to populate screens quickly and export changes to the rest of your application.

Despite its power, JAM has some glaring omissions. There is no debugging facility, the assumption being that modules built in other languages will be debugged there. There is no on-line help for JPL, either, though the refer-

ence manuals are comprehensive. JAM's rather primitive screen editor is undergoing a major overhaul for the next release. The text-based report writer is even more austere, restricting output to a single, fixed-pitch font in one type style.

As of this writing, JYACC was revamping its JAM/Pi for Windows. The next release, due out by the end of the year, will include a true WYSIWYG screen editor, an interactive menu builder, and a debugger.

If you need to connect to multiple vendor servers or are planning to include Unix front ends in your application, JAM offers many strengths. But if Windows is your sole platform and you want to construct rich GUI interfaces quickly and easily, JAM may prove too sticky. □

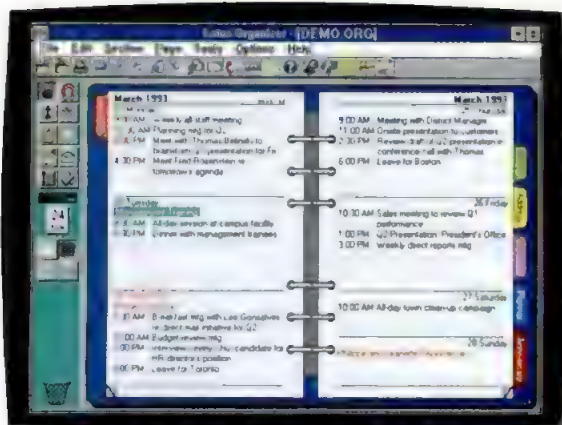
► FACT FILE

JAM Client/Server Application Development Tools
JYACC Inc., 116 John St., New York, NY 10038; 212-267-7722; fax, 212-608-6753.

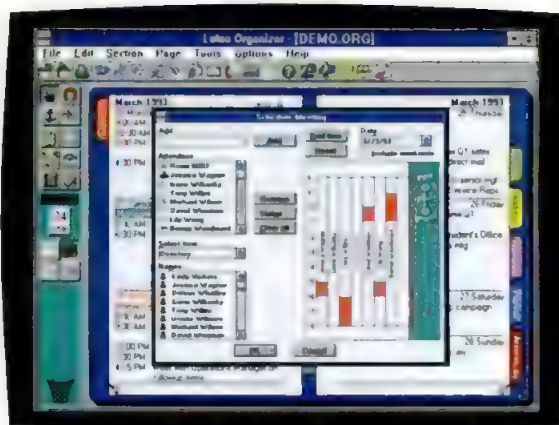
List price: JAM/Pi for DOS, Version 5.04e, \$395; JAM/Pi for Windows, Version 1.5, \$395 (requires JAM/Pi for DOS 5.04e); JAM/DBi Sybase for DOS, Version 5.10, \$395; JAM/ReportWriter for DOS, Version 5.1, \$395.

Requires: 286-based PC or better, 6MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.x, C or COBOL compiler.

Circle 456 on Reader Service Card

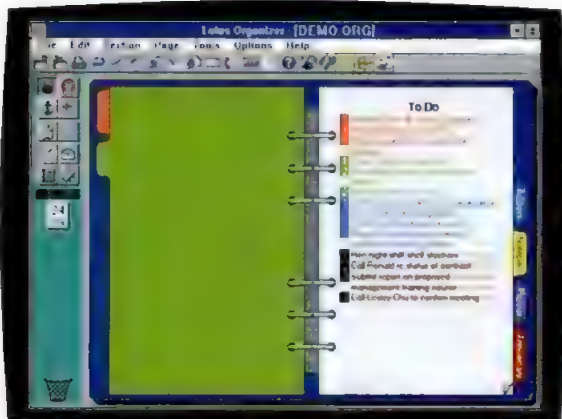


With Organizer, you can change the format of your calendar as you work: view it by day, by week, or even two weeks.

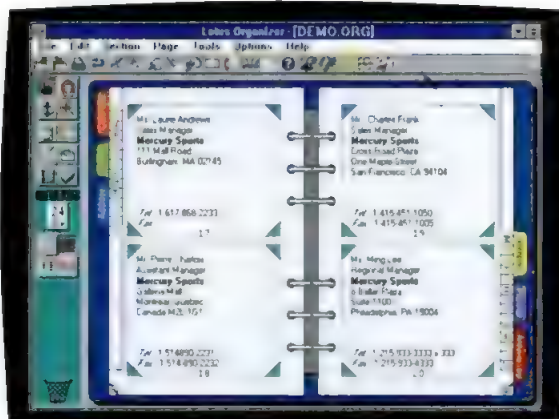


Lotus Organizer with group scheduling makes it fast and easy to set up a meeting among a large group of people—no matter where they're located.

So, what does your day look like?



The To-Do section lets you prioritize tasks as you enter them and view entries by due date.



Sort your address book in any of four formats: name, company, zip code and type of record. An Auto Dialer lets you simply drag and drop to dial a number through your modem.

If you're like most business people, it's not a pretty picture.

Unless of course, you've chosen to use Lotus Organizer.™ As an on-screen calendar, to-do list, yearly planner, address book, notepad and anniversary reminder, Lotus Organizer could very well bring the order and efficiency you demand in your life. (Not to mention the sanity.)

Like a traditional planner, it works in familiar ways with named tabs for each section and pages that actually turn. But unlike any traditional planner, it allows you to do so many things you've never been able to. Like link entries stored in different sections, virtually any way you want. Plus,



you can customize Organizer by renaming tabs, changing colors, and creating sections as you need to.

To remind you of an upcoming commitment, Organizer sounds an alarm at a pre-set time. It can also schedule your meetings, carry overdue tasks forward from day to day and, of course, print pages in formats to fit popular manual organizers.

So if you'd like to increase your productivity, efficiency and control over your daily business life, call Lotus at **1-800-872-3387, ext. 9111**. Or take a little time and visit your Lotus Authorized Reseller.

How's this afternoon look?

Lotus Organizer

PowerBuilder: *Coming of Age*

by Brian Butler

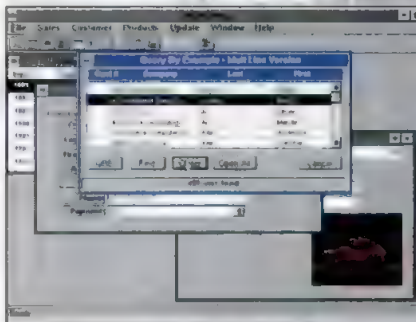
Powersoft Corp.'s PowerBuilder, Version 2.0, is already known as a gem among Microsoft Windows-based client/server application-development tools. (For a full review, see "SQL: The Sequel—Front-End Tools" *PC Magazine*, September 29, 1992). Our tests on a beta release of Version 3.0 of Power Builder show that Powersoft has further polished the product's already robust feature set and added sparkling new functionality. The company expects to ship the new release by the time this article appears.

Once considered a tool best suited for departmental databases, PowerBuilder's sophisticated object-oriented environment is now attracting the attention of enterprise-wide application developers. With Version 3.0, Powersoft incorporates features that the enterprise-wide market demands. Most importantly, PowerBuilder now provides an open API for integrating existing CASE tools and version-control software into the development environment. It also offers DRDA (Distributed Relational Database Architecture) support for improved connectivity with IBM mainframes.

OBJECTS AND PAINTERS

PowerBuilder uses a BASIC-like scripting language (called PowerScript) to

create program logic and custom controls. PowerScript's object-oriented paradigm supports multilevel inheritance of window objects, menu objects, and custom user objects. These objects encapsulate the processing logic, pro-



PowerBuilder 3.0's object-oriented paradigm supports multilevel inheritance of window objects, menu objects, and custom user objects.

viding a central point to add application features or make changes. The ability to create custom user objects lets you quickly develop a pool of objects specific to your business needs. New to this release is the ability to create dynamic custom user objects, which allows the developer to respond to end-user requests at execution time.

PowerBuilder provides graphical point-and-click tools called Painters that let the developer create applications with very little coding. A common look and feel is maintained across all 11

Painters, helping you achieve a quick start and fast productivity.

The development cycle usually begins with the Database Administration Painter, which is used to create tables, define primary and foreign keys, and perform simple database administration. New to this release is the support for defining referential integrity rules through primary or foreign keys, if supported by the database back end.

After defining the database, the developer uses the Application Painter to define the libraries to be used, application icons, default font sizes, and scripts for events when the application is opened and closed. From this point you can develop windows, menus, and PowerBuilder database objects called DataWindows.

One of PowerBuilder's most powerful features is the ability to create DataWindows: intelligent database objects that present, manipulate, and update information. With the DataWindow Painter, creating a DataWindow is a simple point-and-click affair that requires almost no coding. From a graphical representation of your database tables, you visually create SQL queries to retrieve desired data. Presentation styles have been expanded to include CrossTab, Graph, and Label. But the developer is not limited to DataWindows alone to communicate

require Builder/2.

Builder/2 consists of PAS/2's proprietary, event-driven language, ASL; editors for designing windows, menus, and program modules; a Makefile utility; a C interface; and, by the time this review is printed, a VIM mail interface. The package includes clipboard and DDE support together with APIs for REXX (a Systems Application Architecture procedural language), and PAS/2 objects such as Report and Chart. A full-featured, interactive debugger is also

BUILDER/2 IS SEAMLESSLY INTEGRATED INTO OS/2'S WPS AND USES OS/2 RESOURCES WHENEVER POSSIBLE. THE PROGRAM ALSO MAKES USE OF OS/2'S MULTITHREADING CAPABILITIES.

included with the program.

As with the core product, Builder/2 is seamlessly integrated into OS/2's WPS and uses OS/2 resources whenever possible. For example, PAS/2 Help files are generated through OS/2's IPF (hypertext help system) and may be linked to OS/2's

Master Help index. Builder/2 also makes use of OS/2's multithreading capabilities. Connections to multiple back ends can each be handled in a separate process, with the results joined through DDE links.

Both the Window and Menu editors are visual programming tools that automatically generate ASL code that you may modify to suit your needs. ASL is essentially an object-oriented language, although it does not support inheritance. You can introduce new objects and controls into PAS/2 by writing them in C or C++ and placing them in a DLL. Once

with the database back end. SQL statements can be embedded within scripts for total flexibility and control.

STANDALONE DEVELOPMENT

Another significant enhancement is the bundling of Watcom International Corp.'s SQL database engine. If you wanted to develop on a standalone machine with the previous versions, you had to purchase a Windows-based SQL engine—not a cheap proposition. Applications developed against the Watcom engine can be distributed royalty-free.

PowerBuilder has always been strong in its support for a wide variety of database back ends, including HP-Allbase, Gupta SQLBase Server, IBM DB2 (through Micro Decisionware's Database Gateway), Informix servers, Microsoft SQL Server, Oracle servers, Sybase SQL Server, and XDB servers. New to this release is support for Watcom SQL and for ODBC, which lets PowerBuilder connect to databases not directly supported.

One of the biggest weaknesses in previous versions of PowerBuilder was its poor report writing. Version 3.0 addresses this with enhanced support for a variety of report formats, including tabular with multiple control breaks, free-form summary, label, and multicolumn. Powersoft has also added the ability to perform crosstabs and incorporate a variety of business graphics, including pie, bar, and area charts, into reports. Print Preview and Print Preview Zoom features are also new.

registered, they can be used with other PAS objects. If you need a new object but don't want to go through the trouble of writing C code, IBM can provide you with an undocumented API that shows how to create new PAS objects with ASL. In the longer term, IBM is working on an ASL tool set that will use OS/2 2.1's System Object Model (SOM/2) to generate PAS/2 objects.

Builder/2 is a robust development environment that was able to meet most of our test requirements with relatively little coding. Since our tests were geared toward transaction processing, which is

You can also place bitmaps (a company logo, for example) or graph objects in the foreground, band, or background of reports. As before, PowerBuilder supports multipass reporting.

Other enhancements to PowerBuilder are minor in comparison but welcome nonetheless. Right-mouse-button support and the ability to lasso several objects have been added. Configurable toolbars are now supported throughout, along with a 3-D look and feel. The Application Painter now lets developers graphically view an entire application object hierarchy.

THE SOPHISTICATED OBJECT-ORIENTED ENVIRONMENT IN VERSION 3.0 OF POWERBUILDER IS NOW ATTRACTING THE ATTENTION OF ENTERPRISE-WIDE APPLICATION DEVELOPERS.

OPEN API

Not so minor is Powersoft's Client/Server Open Development Environment (CODE), a new open API to the PowerBuilder library management system that lets you import and export PowerBuilder objects. By providing an open API, Powersoft opens the way for integrating third-party tools into the environment. In particular, several CASE tool vendors have announced support for CODE.

One remaining limitation is that PowerBuilder's native check-in and check-out of objects in the Library Manager does not support the sophisti-

cated version-control features necessary for enterprise-wide development. To address this, Powersoft recommends the use of Intersolv's PVCS version-control software, which is integrated into the Library Painter's check-in and check-out facility.

In the past, the company has been known for slow turnarounds on technical help questions. Powersoft has addressed this issue by providing a CompuServe forum, a fax-back service, and a program to certify consultants. It has also more than doubled technical-support staffing and increased the number of phone lines to their BBS.

We didn't formally test Version 3.0 for this story, as the company did not have final code ready in time to meet our deadline. But the late beta version we informally tested breezed through our test application in less than two days, providing all the functionality we required. The release version promises to be a winner with its many new features and enhancements. □

► FACT FILE

PowerBuilder, Version 3.0
Powersoft Corp., 70 Blanchard Rd.,
Burlington, MA 01803; 800-395-3525,
617-229-2200; fax, 617-273-2540.
List price: \$3,595.
Requires: 386SX-based PC or better,
4MB RAM, 12MB hard disk space, DOS
3.3 or later, Microsoft Windows 3.1.
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not this product's milieu, that's no small accomplishment. The downside to Builder/2 and PAS/2 in general is that their environment is interpreted and relies heavily on DDE. Performance suffers for it. Even on a 486-based PC with 16MB of RAM, the system was noticeably sluggish. This is unfortunate, since PAS/2 has so much else going for it.

Still, if you need a solid OS/2 decision-support package in an IBM environment and you don't mind waiting a little while for results, PAS/2 with PAS Builder/2 may be just the combination that you've been looking for.

Informix Software Inc.

Informix-HyperScript Tools for Windows

BY RON ANDERSON

Informix Software's vision of SQL front-end programming is based largely on cross-platform portability. With the introduction in June of Informix-HyperScript Tools for Windows, Version 1.0—the first in a salvo of end-user products for your enterprise-wide network—Informix

APPLICATIONS DEVELOPMENT

Front-End Development Tools

started making that vision real.

Following the Microsoft Windows product, the company will be releasing versions for Motif and for Apple's System 7. Programs written in one environment using HyperScript Tools will compile and run on any supported platform. As with any cross-platform system, HyperScript Tools will not completely satisfy the user-interface purist from any particular GUI camp; too many trade-offs in the name of compatibility are necessary. But if Informix can deliver on its promise of application portability, the holy grail of enterprise-wide networks is somewhere just around the corner.

CONNECTIVITY CONSIDERATIONS

The Informix name has been synonymous with SQL for a very long time, especially in the Unix environment. Informix's SQL back end is available in two flavors: Informix OnLine (we reviewed Informix OnLine for NetWare in our issue of October 12, 1993) and Informix SE. But unlike many of the other products

and ASCII text, but will not access these files in their native formats.

Before you start with HyperScript Tools, you need to do some work from the DOS prompt. Informix's database server connectivity software, INet, is a DOS TSR that requires from 62K to 72K to load. This TSR must be loaded prior to starting Windows if you intend to access an Informix server or a HyperScript application from within HyperScript Tools. You also need to log on to the database server when you load the TSR.

FEAST, NOT FAMINE

HyperScript Tools is composed of the Project Manager, the HyperScript programming language, and six development tools: the Script Builder, Dialog Box Builder, Menu Builder, Portfolio Builder, Worksheet Builder, and Help Builder. The Project Manager glues these building blocks together and gives you a single point of entry and management for the various components that make up your project. A single-user local database engine is also included, so you can develop and debug your application before you move it to the server.

Developing our test application proved to be more feast than famine. We started by creating a new project, and adding forms, menus, and scripts to the application involved nothing more than clicking on the appropriate builder icon in the Project Manager. The numerous graphical tools and assortment

of functions available usually left us with a number of paths to follow.

One notable exception to this rule involved the lack of built-in support for input and display masking. We wanted the phone number field in the test app to include parentheses automatically around the area code and a dash between the two parts of the number. This standard function, known as masking, is available with most database

application development systems and makes it possible to set up fields for masked input in a couple of minutes. With HyperScript Tools, it would take hours to code a custom masking script that included key checking and monitored cursor location.

Of all of the builders available, the function of the Portfolio Builder is least self-evident but well worth the

trouble to learn. In HyperScript Tools, a portfolio is a document that contains sketches made of graphical objects, pictures, and controls. Portfolios make navigation through the

application easy because selections are graphically represented. By combining the Portfolio Builder's functionality with the excellent graphing capabilities built into the Worksheet builder, your EIS/DS applications are guaranteed to provide powerful information at a glance.

Developing our test application with Informix-HyperScript Tools for Windows was a breeze. The numerous graphical tools and assortment of functions available usually left us with a number of paths to follow.

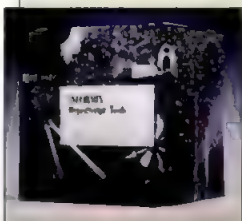
reviewed here—and contrary to Informix's vision of portability—HyperScript Tools applications can connect only to Informix's own SQL RDBMS. Informix has announced plans to expand the product's horizons by having it support Microsoft's ODBC and Apple's DAL (Data Access Language) in a future release. Additionally, HyperScript Tools will import and export local files from Microsoft Excel, Lotus 1-2-3,

SUITABILITY TO TASK				
Informix-HyperScript Tools				
	POOR	FAIR	GOOD	EXCELLENT
Custom application development	●	●	○	○
EIS/DS applications	●	●	●	○
Fast application development	●	●	●	○
Cross-platform development	●	●	○	○

FACT FILE

Informix-HyperScript Tools for Windows, Version 1.0

Informix Software Inc., 4100 Bohannon Dr., Menlo Park, CA 94025; 800-388-0366, 415-926-6300; fax, 415-926-6593



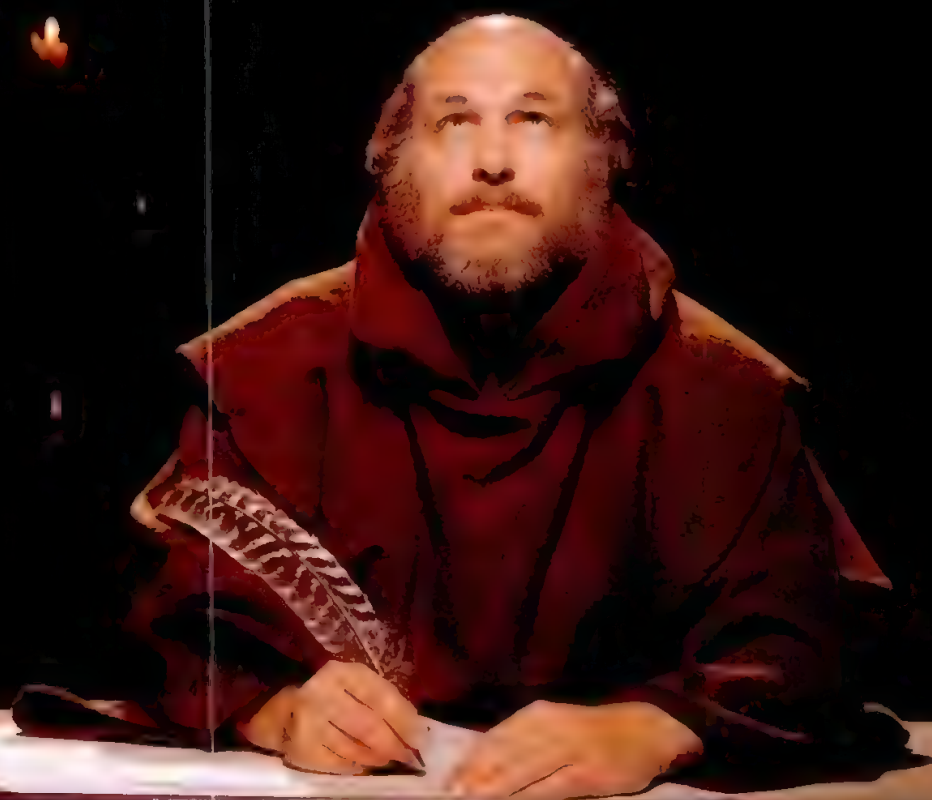
List price: \$1,495, \$100 per runtime license (\$200 per runtime with Informix INet; volume discounts available).

Requires: 386-based PC or better, 8MB RAM, 10MB hard disk space, VGA monitor or better, DOS 3.1 or later, Microsoft Windows 3.1

In short: Part of an ambitious, enterprise-wide database application development suite, Informix-HyperScript Tools for Windows is a good start if you are running one of Informix's SQL database servers. The product is well-thought-out and easy to use, it could benefit from additional development work. If you need a database-development environment that provides cross-platform support, Informix Software has the plan for you.

ON READER SERVICE CARD

Behold.



The HandBook®

Size

The difference between a 3-pound portable and a 4-pound portable doesn't sound like very much until you lug one around for hours. Then every ounce counts! HandBook users sing the praises of the

HandBook's size. It's big enough to be fully functional, but small enough to take anywhere effortlessly.

Battery

A 2.2Ah NiMH rechargeable battery comes with your HandBook. The battery lasts up to four hours with power management, about two hours without power management. You receive an AC adapter charger that charges the battery pack separately or in the HandBook. The HandBook also has a

convenient alkaline battery pack option which enables you to use over-the-counter double-A batteries, too.

Drive

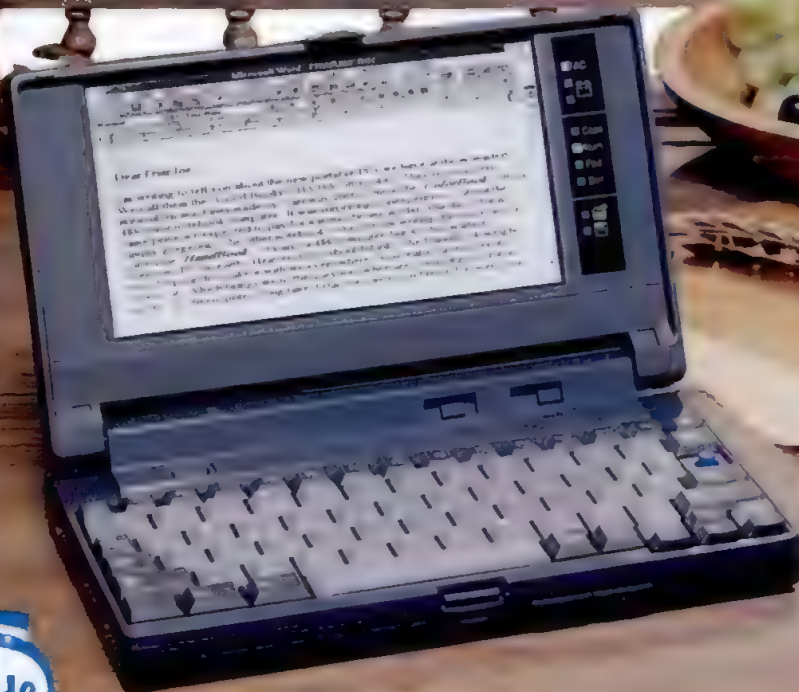
The HandBook 486 includes an 80MB or 130MB hard drive for today's larger Windows programs and files. With the Interlink software utility and serial download cable provided, you can easily transfer data between the HandBook and other PCs.

Display

Looking at the HandBook's VGA display is easy on your eyes. It's the largest backlit display of any subnotebook in this world or the next, and you can use it comfortably in all lighting situations.

Suspend/Resume

Suspend/resume is one of the features HandBook users rejoice about! It allows you to stop work any time, leave all your Windows applications open, then resume instantly at exactly the same chapter and verse without losing anything or restarting the system. It's great for taking notes in meetings!



The ColorBook

Dual-Scan STN Display

Dual-scan STN color is the latest technology in portable color displays. The incredible quality of the LCD coupled with local bus video gives you truly out-of-this-world graphics. You can display up to 256 colors with the ColorBook running in VGA mode.

Battery

You can have faith that your rechargeable battery will last up to four hours with power management, over two hours without power management. You also get an AC adapter/charger capable of fast-charging the battery separately or during operation in the ColorBook.

Suspend/Resume

Gateway 2000 HandBook users like suspend/resume so much we designed it into the ColorBook as well!

Drives

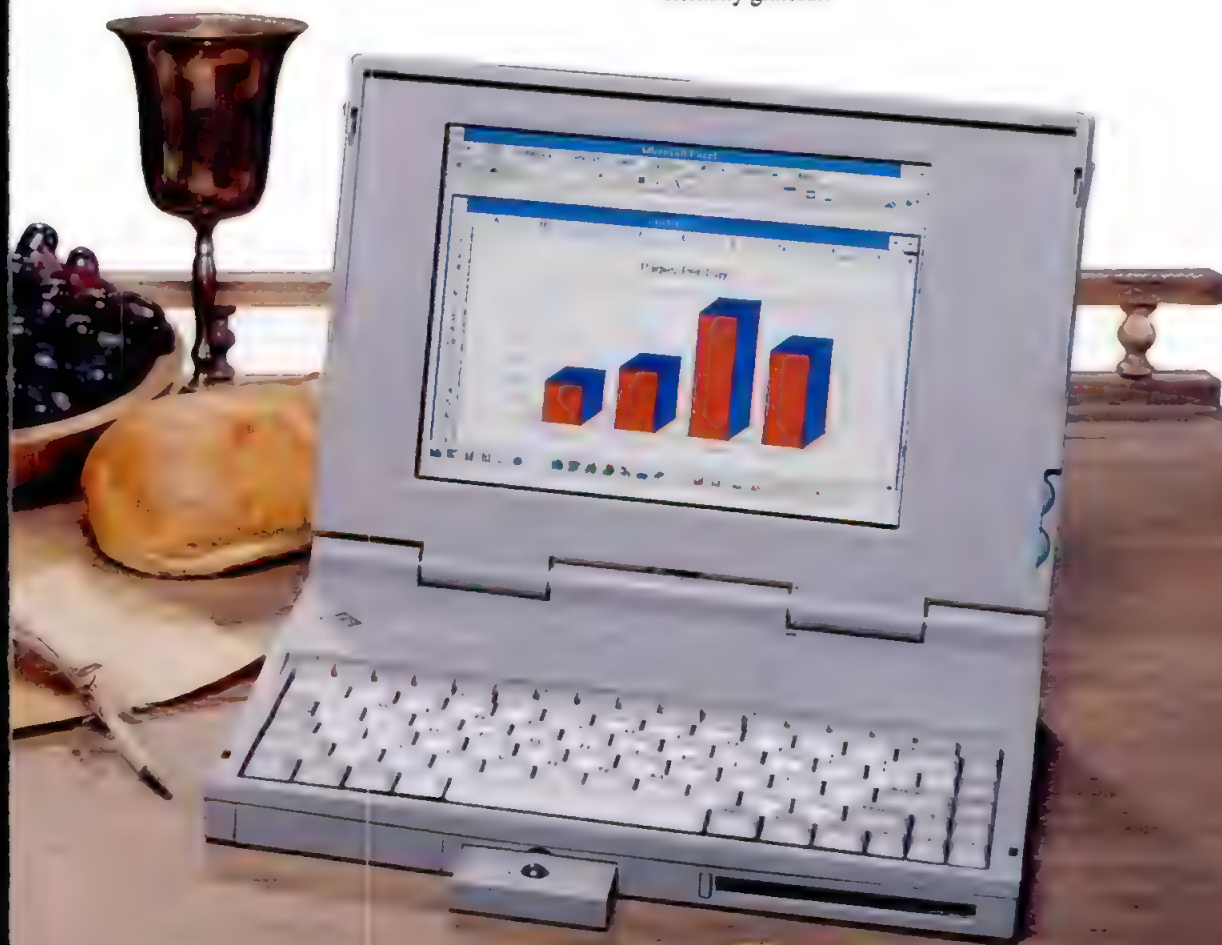
The ColorBook includes a floppy drive and a high-capacity hard drive. The hard drive is removable — a handy feature for companies where notebooks are checked out to multiple users. Upgrading to a larger drive in the future is also much easier with the ColorBook's removable hard drive.

External Ports

The ColorBook has parallel, serial, PS/2 and VGA ports. You can use it with an external mouse, keyboard and monitor. The ColorBook supports simultaneous video and allows you to display your ColorBook screen on an external monitor in up to 1024 x 768 resolution.

Your Calling

Surely one of these "good books" is a match made in heaven for your needs. Give us a call. We'll be eternally grateful!



"You've got a friend in the business."®

8 0 0 - 8 4 6 - 2 0 2 9

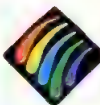
The Gateway 2000 HandBook® And ColorBook Are Simply Divine!

If you're looking for the perfect portable PC for your next pilgrimage, look no further than the HandBook and ColorBook from Gateway 2000.

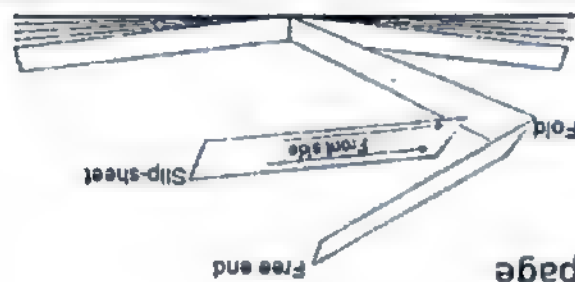
One of these notebooks is the answer to your prayers.



The HandBook 486 is the next generation of the original HandBook, the product that was the genesis of an entirely new portable PC category dubbed "subnotebook" computers. The new product is blessed with many improvements while retaining all the things people love about the first model. With the HandBook 486, you get the smallest Windows™ PC in this world — and when using a 486DX2 processor, the HandBook is by far the most powerful PC of its size. New HandBook 486 models include SL Enhanced Intel486® CPUs and come with 4MB RAM (expandable to 20MB), 80 or 130MB hard drive, backlit VGA display, built-in pointing device, and one PCMCIA slot. All this and the HandBook 486 still weighs under three pounds, is smaller than the day planners many people carry, and starts at \$1,495. Once you get your hands on a HandBook 486, you'll be a HandBook convert.

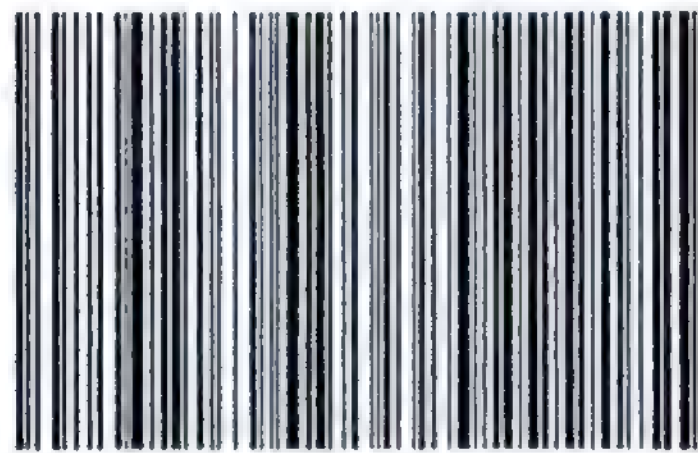


The ColorBook is the 486 color notebook that's priced the same as other companies' black-and-white models. With the ColorBook, you get bright, crisp color graphics from the dual-scan STN display. You get a small, easy-to-carry notebook. The ColorBook weighs less than 5.7 pounds and measures 11.7" x 8.5" x 1.77". It's one of the thinnest color products on the market. And, you get 486 performance. ColorBook models are based on SL Enhanced Intel486® processors, and include the virtues of a 1.44MB floppy drive, 4MB of RAM (upgradeable to 20MB), a large, fast hard drive, integrated track ball and two PCMCIA Type II card slots. All this starting at under \$2,000. Heavenly!



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet

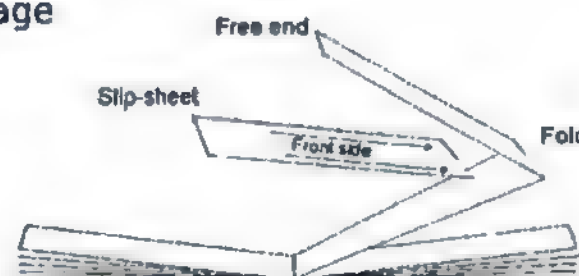


GbsSlipSheet-001

Folded edge of the page

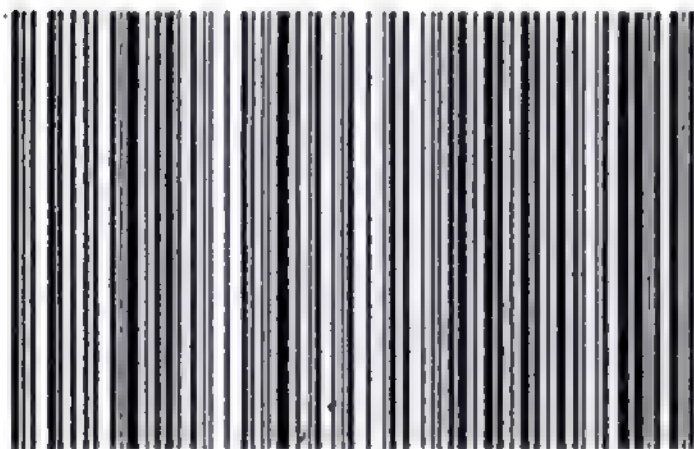
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back

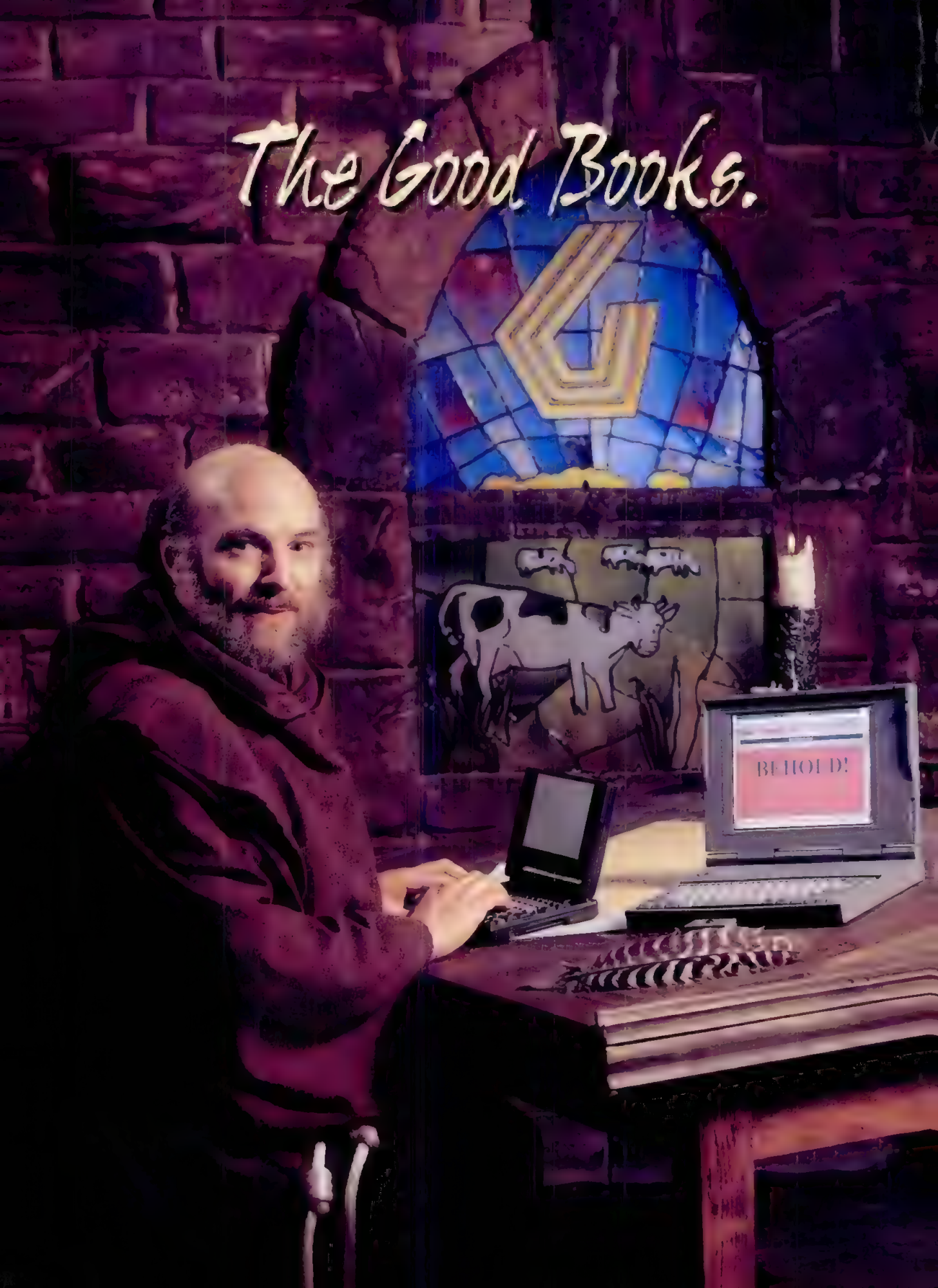


GbsSlpBack-001B

Back

1. Follow instructions on the other side

The Good Books.



Good Book Review

COLORBOOK 486SX-25

- Weight: Under 5.7 Lbs.
- Dimensions: 11.7" x 8.5" x 1.77"
- 25MHz SL Enhanced Intel® 486SX CPU
- 4MB RAM (expandable to 20MB)
- 3.5" 1.44MB Diskette Drive
- Removable 80MB IDE Hard Drive
- 9.4" VGA Dual-Scan STN Color Display
- NiMH Battery & AC Pack
- Suspend/Resume Feature
- 2 PCMCIA Type II (or 1 Type III) Slots
- Integrated Track Ball (2 Buttons)
- 85-Key Keyboard
- Parallel, Serial & PS/2® Ports
- External VGA Port
- MS-DOS 6® and Windows™ 3.1

\$1995

COLORBOOK 486SX-33

- Weight: Under 5.7 Lbs.
- Dimensions: 11.7" x 8.5" x 1.77"
- 33MHz SL Enhanced Intel 486SX CPU
- 4MB RAM (expandable to 20MB)
- 3.5" 1.44MB Diskette Drive
- Removable 170MB IDE Hard Drive
- 9.4" VGA Dual-Scan STN Color Display
- NiMH Battery & AC Pack
- Suspend/Resume Feature
- 2 PCMCIA Type II (or 1 Type III) Slots
- Integrated Track Ball (2 Buttons)
- 85-Key Keyboard
- Parallel, Serial & PS/2 Ports
- External VGA Port
- MS-DOS 6 and Windows 3.1

\$2395

COLORBOOK 486DX-33

- Weight: Under 5.7 Lbs.
- Dimensions: 11.7" x 8.5" x 1.77"
- 33MHz SL Enhanced Intel 486DX CPU
- 4MB RAM (expandable to 20MB)
- 3.5" 1.44MB Diskette Drive
- Removable 170MB IDE Hard Drive
- 9.4" VGA Dual-Scan STN Color Display
- NiMH Battery & AC Pack
- Suspend/Resume Feature
- 2 PCMCIA Type II (or 1 Type III) Slots
- Integrated Track Ball (2 Buttons)
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EASY LOOK AND FEEL

The graphical tools provided with the builders made it simple to create our test forms and menu structures. As with most other visual development environments on the market, HyperScript Tools reduced development of the test application's look and feel to a small percentage of our total development time, letting us concentrate on script writing.

The HyperScript programming language includes most of the programming flow constructs and functions that you would expect from a high-end development system. The Script Builder provided us with the tools we needed to write and debug our test application, although it does not support on-the-fly syntax checking. The debugger includes stepping, breakpoints, watchpoints, watch vari-

ables, and immediate mode-variable manipulation.

The Worksheet Builder provides all of the functionality of Informix's Wingz spreadsheet software. These spreadsheets are ready-made to accept and manipulate row after row, column after column of data from your SQL RDBMS. Populating your worksheets with data from the server involves executing simple built-in func-

• ObjectView: *Getting Better*

by Gabrielle Gagnon

KnowledgeWare acquired ObjectView from Matesys in February of this year and is hastening to fold ObjectView into its product line. ObjectView for Windows, Version 2.0, was released in March, and Version 2.1, now in beta, is due for release soon. By next year, Version 3.0 should be fully object-oriented and will include project resource management features such as version control, a centralized object repository, and graphically implemented security.

PROPRIETARY SCRIPTING LANGUAGE

For now, Version 2.1 of ObjectView still closely resembles the Matesys product. It contains a logical data modeler for form definition, a screen editor for customizing screens, and a visual query tool. All of these components generate ViewScript code, a proprietary, event-driven scripting language similar to BASIC and geared mostly toward handling screen events. You can supplement its power by calling your own C or C++ functions from DLLs. ObjectView carries most of the standard Microsoft Windows controls and several of its own custom controls. The Graphics object lets you build event-aware graphs, and the Extended Table is a data-aware, two-dimensional grid that can select blocks of data and perform mathematical calculations and other spreadsheet functions on them. Other ObjectView tools include an interac-

tive debugger, a compiler, a report writer, and utilities for managing resources and objects. One especially handy feature is the Mini Album, which lets you store and manipulate images for use in your application. Another useful tool is the Object Manager. With it you can build libraries of common objects that can be reused in other applications.

STRONG BACK-END SUPPORT

On the back end, ObjectView directly supports numerous database servers, including Informix servers, Ingres Server, Microsoft SQL Server, Oracle

dialects of the back-end servers. The Form Definition and Visual Query utilities will convert ANSI SQL to the specific dialect and formatting conventions required by many of the supported databases.

SOME QUIBBLES

While its interface is slick and its SQL capabilities are unparalleled, the current version of ObjectView has some disappointments. Whenever you move from one tool to another, the system makes you log on to the database—a nuisance when working on a complex application. Also, the report writer is not a WYSIWYG application; you must use the preview mode to see what the report will look like. Finally, ObjectView's code generation is somewhat of a tease. It seems to promise true visual programming but forces you to program too many standard operations by hand.

Despite these annoyances, ObjectView is a capable client/server development tool with transparent connectivity to a variety of database servers. □

► FACT FILE

ObjectView for Windows, Version 2.1
KnowledgeWare Inc., 3340 Peachtree Rd. NE, #1100, Atlanta, GA 30326;
800-295-0570, 404-231-8575; fax, 404-365-0246.

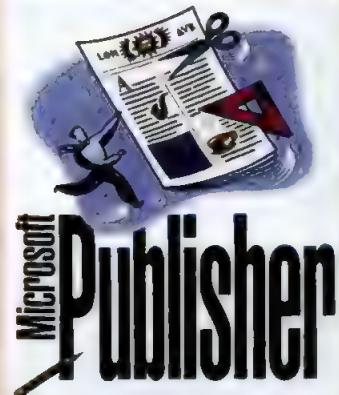
List price: \$2,799.

Requires: 286-based PC or better (386 or better recommended), 4MB RAM, 15MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.x.

Circle 457 on Reader Service Card

OBJECTVIEW FOR WINDOWS CARRIES MOST OF THE STANDARD WINDOWS CONTROLS AND SEVERAL OF ITS OWN CUSTOM CONTROLS; IT DIRECTLY SUPPORTS NUMEROUS DATABASE SERVERS.

servers, and Sybase SQL Server. DLLs are also included for ODBC and HLLAPI (High-Level-Language Application Programming Interface) connections. ObjectView also ships the popular Q+E ODBC Pack database library, so you have a choice of interfaces to your favorite database server. ObjectView supports all of the SQL databases that Q+E ODBC Pack does, but the latter gives you additional access to some non-SQL formats, like Microsoft Excel spreadsheets. One advantage to ObjectView's database DLLs is that users don't need to be familiar with all the various SQL



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* May 1995 * Vol. 1, No. 1 * Published by the Island Hopper News Service

Day Trips: Hurdle Botanical Gardens and Corelli Island Farm

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There's Sunken Treasure Along Ferry Route

The first scheduled coverage of Outer Bay begins in 1964 when French and English fish trappers arrived in the area and set up businesses.

While renowned for their hunting and trading skills, the businessmen had a keen eye for the public on weekends. Just that evening offers a variety of educational demonstrations, including organic gardening, along shooting, color matching, and bookkeeping. The demonstrations vary from week to week, and lasted to minutes.

Summer Schedule

Event	Location	Time	Cost
Learn to Cook	Learn to Cook	10:00 am	\$10.00
Learn to Cook	Learn to Cook	10:00 am	\$10.00
Learn to Cook	Learn to Cook	10:00 am	\$10.00
Learn to Cook	Learn to Cook	10:00 am	\$10.00
Learn to Cook	Learn to Cook	10:00 am	\$10.00
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Learn to Cook	Learn to Cook	10:00 am	\$10.00
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Experience the Hurdle Botanical Gardens in the summer - a small donation is suggested. For more information, visit for a brochure at any Grand Lagoon Pub. For more information, visit for a brochure at any Grand Lagoon Pub. For more information, visit for a brochure at any Grand Lagoon Pub.

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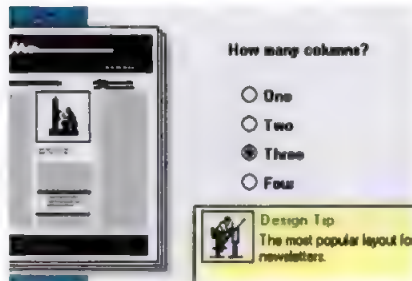


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tion calls. Similarly, the data entry form in our test application (which included VCR-like controls for next and previous records) was easily created and populated by using a scrollable cursor coupled with HyperScript function calls.

PORTABILITY TRADE-OFFS

Because Informix needs to keep code compatibility between the various operating systems it supports, the features available for any one platform can be limited by their availability on other platforms. For example, Windows OLE or other interprocess communications facilities are not supported at all. Windows DDE is supported in both client and server mode in the Windows version, but using this functionality renders parts of your application incompatible with the other host OS versions. Informix does include a handy Application Porting and Deployment guide to help you make decisions about coding for multiplatform support; with multiplatform support, the lowest common denominator becomes the rule-of-thumb.

Where possible, Informix does attempt to overcome these limits. Take the Help Builder, for example. Since the help systems for Windows, the Mac operating system, and Motif are different, Informix doesn't use any of them; instead it gives you the Help Builder. By creating your help system using Help Builder, all of your users will have access to the same level of on-line help, regardless of the host platform.

HyperScript Tools is one shipping product in a suite of cross-platform database applications that Informix has under development. If you are supporting multiple operating systems on your network and need to provide database applications for Windows, Motif, and Macintosh clients, then Informix is a vendor—on a very short list of vendors—that you'll want to contact. The few problems we encountered—lack of support for masked input, for example—are typical of Version 1.0 software and should be addressed in a future release. But the multiplatform support provided by HyperScript Tools, even in its infancy, puts Informix in a potentially commanding position as a database development environment for the enterprise-wide market.

Ingres Corp.

Ingres/Windows 4GL for OS/2

BY SHERYL CANTER

The greatest strength of Ingres/Windows 4GL for OS/2, Version 2.0, is its cross-platform portability. The same code will run on Motif, Microsoft Windows, and OS/2 Presentation Manager, though you may need to tweak it a bit because of resolution and font differences. The downside of Windows 4GL is that its cross-

still at Version 1.0. We found the product to be a bit rough around the edges. It is difficult to learn, requires extensive coding, and crashed frequently during testing.

THREE INTEGRATED COMPONENTS

Windows 4GL is made of three integrated components: the Application Manager, the interface-design tools, and the 4GL itself. When you first launch Windows 4GL, the Application Manager prompts you for the database you would like to access, then displays a catalog of the applications created for that database. By selecting the application, you get a list of the application's components: dialog box or menu frame, 4GL or 3GL procedure, user class, global variable, or database procedure.

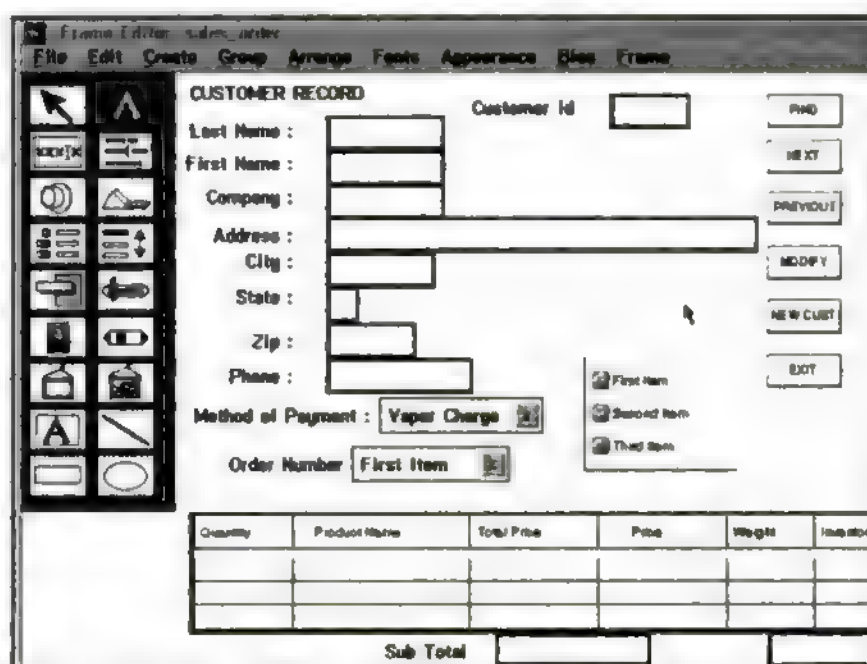
Windows 4GL was designed for use by a team of developers. Applications are stored in the database on the server during development, but the code can be extracted to a text file via the ExportApp utility, a separate application. When you select an application component, Windows 4GL checks it out under your name. Multiple versions of compo-

nents can be saved, and you can save components "privately," which means that they are not added to the application and are invisible to other developers. When completed, applications are compiled to image files that reside outside the database. A runtime module is needed for execution.

The Frame Editor (a "frame" is the Ingres term for a form) and the Menu Editor are the interface-design

tools of Windows 4GL, but they are not integrated with each other. When in Design mode in the Frame Editor, you cannot see the menus in your application. In fact, you can't even tell if you have menus defined until you launch the Menu Editor.

The Script Editor is also launched from the Frame Editor. Windows 4GL



The Frame Editor in Ingres/Windows 4GL for OS/2 lets you visually design the user interface. The Script Editor and Menu Editor can be launched from the Frame menu.

platform compatibility forces a least-common-denominator approach, which may not take advantage of the special strengths of your particular platform.

The tradeoffs are manifested in the package's monochrome user interface, the limited number of bitmapped formats that are supported (only .GIF, X bitmap, and Sun-Raster), the limited number of interface objects that are available, and the lack of support for advanced features such as DDE.

Windows 4GL can connect only to Ingres databases. Also, you must be connected to Ingres Server through Ingres/Net, as there is no standalone development version. We reviewed the OS/2 version of Windows 4GL, since it is the latest implementation on the PC platform; the Microsoft Windows version is

SUITABILITY TO TASK				
Ingres/Windows 4GL for OS/2				
	POOR	FAIR	GOOD	EXCELLENT
Custom application development	●	●	○	○
EIS/DS applications	●	○	○	○
Fast application development	●	○	○	○
Cross-platform development	●	●	●	○



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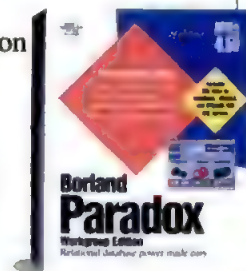
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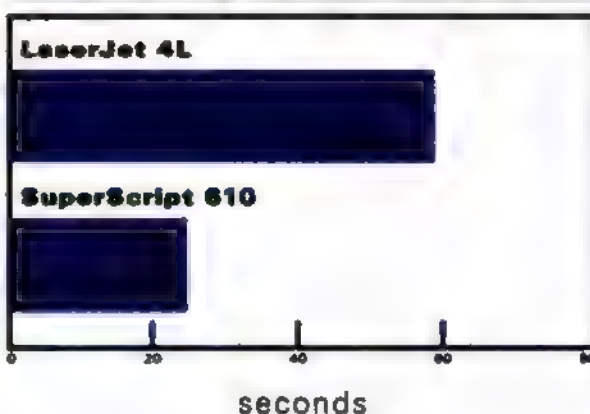
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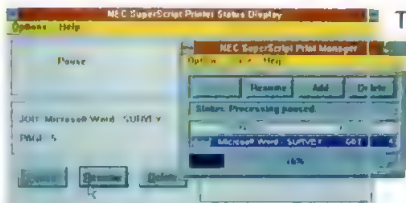
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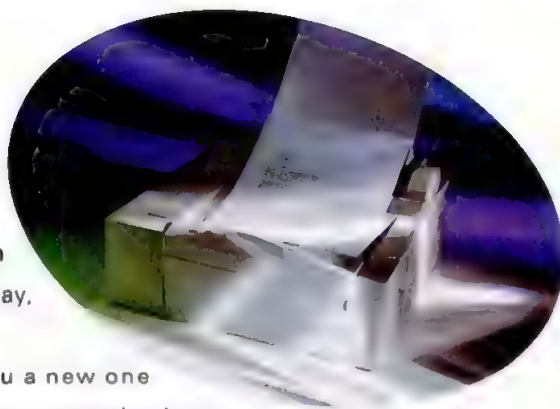
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APPLICATIONS DEVELOPMENT

Front-End Development Tools

uses an event-driven model, but one script is used per frame. Sections within the code tell how the program should operate when specific events occur—for example, what to do when a menu item is selected. This is in contrast to the approach other development tools (such as Microsoft Visual Basic) take, where snippets of code are attached to each separate interface object.

By default, the OS/2 system editor is used to edit scripts. But because you must close the OS/2 editor before compiling a program, a limited, internal editor ships with the product. The internal editor uses a small and difficult-to-read system font that can't be changed, but at least files can stay conveniently open during compilation. To use the internal editor, you must edit the CONFIG.ING file. Once you've done this, you can switch to the OS/2 system editor via a menu choice, but after compilation Windows 4GL will revert back to the internal editor unless you again edit the CONFIG.ING file.

OBJECT ORIENTATION

The product's 4GL is object-oriented and closer in style to C++ than to BASIC, the scripting-language paradigm used by many other products. It supports classes, objects, methods, and inheritance. The system classes are hierarchically organized and define frames, forms, menus, and fields. Object properties such as position, size, font, and default value can be set statically, or changed dynamically at runtime. The BitmapObject class makes up for the fact that the Ingres database doesn't support BLOBs: It stores bitmaps in 2K pieces (the maximum possible row size) and then re-assembles them on the fly as you access them. It's slow, but it works.

You can create "user classes," but these are more accurately called "data structures" since they can't include methods. The 4GL is extensible through libraries (OS/2 DLLs) written in a 3GL such as C. An interactive, source-level debugger lets you set breakpoints, step through your code, and trace execution in a log window.

You can test your application without leaving the development environment by selecting Go from the menu. Programs are stored in what Ingres calls an

Intermediate Language (IL), which like p-code is a partially parsed format that is then interpreted. There is no on-the-fly syntax checking, however; you must select Go to see your errors.

FEW EXTRAS

Windows 4GL is not as polished and feature-rich as many of its competitors. For example, you can only control the exact dimensions of a window if it's a child win-

CODING IS NEEDED FOR VIRTUALLY ALL FUNCTIONALITY IN INGRES/WINDOWS 4GL FOR OS/2, AND THERE IS NO ON-LINE HELP WHATSOEVER.

dow; otherwise the size is determined automatically according to field size and placement. Also, you can't change the default tab order (right to left and top to bottom), although you can specify where to go next for specific fields. Another disconcerting quirk is that Windows 4GL does not change the cursor to a clock icon while it's loading modules or processing.

The status bar at the bottom of the window tells you what the program is doing, but if you don't realize this, you may think the program has hung up the system.

Windows 4GL has only the most limited graphing capabilities. These are limited to primitives for simple bar charts and line graphs. There is no report writer at all, though a character-based report writer is available as a component of a separate Ingres product (Query & Reporting Tools). Despite its limitations, Windows 4GL is very resource-intensive, requiring a 386 or better processor, 40MB of hard disk space, and 16MB of RAM.

Even the features that Windows 4GL does support are not as easy to use as they could be. Coding is needed for virtually all functionality, and there is no on-line help whatsoever. The saving grace is the manuals, which are detailed and clearly written. Though the manuals are for the Windows and Unix versions of the product, an addendum describes the few platform-specific differences for OS/2.

One important difference between the OS/2 version of the product and the Windows version is the former's lack of support for ODBC. This means that you can't use Windows 4GL to connect to other back ends, even with a third-party gateway such as Micro Decisionware's Database Gateway.

THEY'RE WORKING ON IT

Ingres is aware of Windows 4GL's weaknesses and is working on a major upgrade, Version 3.0, for all three supported platforms (Windows, OS/2, and Unix). One of the most significant enhancements in Version 3.0 will be a sophisticated GUI report writer that will be tightly integrated with the core product. The release date for the new version had not yet been announced as we went to press.

If you are using the Ingres database server and need cross-platform access to its many powerful features, you will want to take a look at Windows 4GL. But unless you fit that profile, your development time will probably be shorter with a product that has more built-in features and is easier to use.

FACT FILE

Ingres/Windows 4GL for OS/2, Version 2.0

Ingres Corp., 1080 Marina Village Pkwy., Alameda, CA 94501-1041; 800-446-4737, 510-769-1400; fax, 510-748-2670



List price: \$1,000; runtime module, \$250 per user

Requires: 386-based PC or better, 16MB RAM for development environment, 8MB RAM for run-

time module, 40MB hard disk space, OS/2 2.x, Ingres/Net, Ingres Server 6.2 or better.

In short: For Ingres databases only, Ingres/Windows 4GL is a multiuser, cross-platform development tool available for Windows, Motif, and OS/2 Presentation Manager. It uses an event-driven model with visual design tools that are limited to the basics. Programming is required for all functionality. The 4GL is object-oriented and bears some similarity to C++. You will find competitors' tools much friendlier, so if you don't need the cross-platform capabilities, you should probably look elsewhere.

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- 64KB External Cache (upgradable to 256KB)
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- PCMCIA 10Base2 Network Interface Card
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- PCMCIA Thick Ethernet Network Interface Card
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Microsoft Corp.

Microsoft Visual Basic for Windows, Version 3.0, Professional Edition

BY SHERYL CANTER

There can be no doubt that Microsoft Visual Basic for Windows is a remarkable, general-purpose programming tool. The question is whether the new data-access support in Version 3.0 makes Visual Basic viable as a full-fledged database front-end development tool.

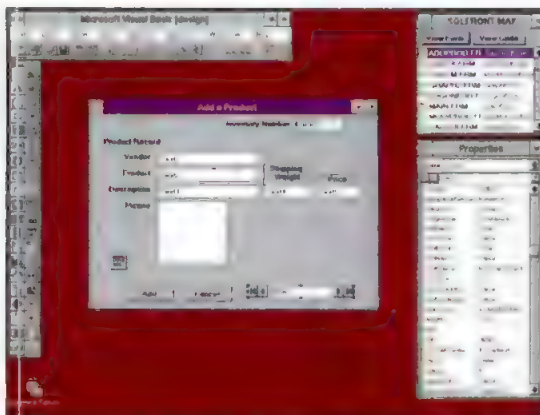
Though there is a booming third-party market of Visual Basic custom controls, we chose to take Microsoft's data-access claims at face value, testing Visual Basic without third-party add-ons. But be warned: without third-party custom controls, you're going to have to do a lot of coding to build a database front end—a situation antithetical to the very concept of Visual Basic. (To fairly reflect how real-world developers use VB, this review also briefly covers some third-party tools we informally reviewed that can enhance front-end development.)

Programmatic control, needed for all but the most basic tasks, is offered only in the Professional Edition. You also need the Professional Edition if you want ODBC support, which is how Visual Basic connects to SQL databases. The Professional Edition includes drivers for Microsoft SQL Server, Oracle Server, and Sybase SQL Server.

Other drivers are available through third-party vendors. For example, ODBC Pack, from Q+E Software (5540 Centerview Dr., #324, Raleigh, NC 27606; 800-876-3101), offers connectivity to over 20 PC and SQL databases. Perhaps the easiest way to use Visual Basic for SQL access is to purchase Q+E MultiLink/VB, which includes the same extensive connectivity, along with a complete set of data-bound controls and a menu-driven query builder.

NOT A DEDICATED TOOL

The database engine that comes with Visual Basic is the same as that used by Microsoft Access, with support for Btrieve, dBASE, FoxPro, and Paradox databases, as well as ODBC. The built-in Data Manager application lets you perform rudimentary data-management tasks for local databases. But because Visual Basic is not a dedicated front-end tool, many of the conveniences found in other database tools are missing.



The data control in Microsoft Visual Basic for Windows has buttons that let you move forward or backward one record at a time, or move to the top or bottom of a record set.

For example, Visual Basic can't read a database and automatically create the fields in a default format, as can most other front-end products. You must laboriously draw each text field and bind it to a database field. To change the tab order, you must select each field in succession

BY ITSELF, VISUAL BASIC IS NOT A QUICK AND EASY TOOL FOR SQL FRONT-END DEVELOPMENT. THE USE OF THIRD-PARTY CONTROLS CAN CHANGE THAT SITUATION DRAMATICALLY.

and change its Tab property—a lot of mouse clicks. Both these tasks are made much easier by VB Assist, from Sheridan Software Systems (65 Maxess Rd., Melville, NY 11747; 516-753-0985).

If you need to move nonsequentially through your data, be prepared to write a lot of SQL code. There is no way to build queries or specify table relationships visually or through menus, as you can with most SQL front-end development tools. There is also no built-in QBF capability.

Though Q+E MultiLink/VB contains a menu-driven query builder, this is for use by the developer rather than by the end user. We could not find a custom control for Visual Basic that provides QBF capability to the end user.

SQL front ends are often developed by a team of programmers, so many front-end development tools have team development features such as check-in, check-out, and version control. Visual Basic has none of these, but because it supports the creation of ASCII versions of forms, it can be used with third-party version control software such as PVCS from Intersolv (3200 Tower Oaks Blvd., Rockville, MD 20852; 800-547-4000).

A powerful and flexible GUI report writer, Crystal Reports 2.0, ships with Visual Basic. But since Crystal Reports was developed by third-party vendor Crystal Services and then adapted for use with Visual Basic, it is only loosely integrated with the core product. You can control the report writer from Visual Basic, but you cannot access variables from your Visual Basic application within the report writer. Visual Basic also has no built-in charting capabilities.

ACCESSING DATA

The Visual Basic data control contains four buttons for moving forward or backward one record at a time, or moving to the top or bottom of the record set. You set up the control by specifying the Database, Connect, and RecordSource properties in the Properties box. The Database property is a path or file specification. The Connect property tells the engine what type of database you're accessing; this is where you would specify the ODBC driver for SQL databases. The RecordSource defines the current record set used and can be a table name or a SQL query.

The next step is to bind fields to the data control. Only a small number of VB controls can be bound to data using the Data Control, basically just text fields and check boxes. If you need others—for example, a data-bound combo box, list box, or grid—you must code it yourself or buy the control from a third party. Sheridan Software Systems offers a prod-

Front-End Development Tools

uct called DataWidgets that contains many additional data-bound controls, including a data-bound grid.

Data-aware controls have two extra properties: DataField and DataSource. The DataSource property holds the name of the data control to which it is bound. The DataField is the name of a field in the database. If the data control has been set up properly, when you click on the DataField property of a data-bound control, you'll see a list of available fields.

HARD BEYOND THE BASICS

Achieving basic functionality is extremely easy. Once you've set up the data control, drawn the fields on your form, and bound them to the data control, you have a working—if primitive—database front end. When you launch your application, clicking on the buttons in the data control will move you through the database and you'll see its records appearing in your bound fields. If you need to go beyond

this basic functionality, however, you'll have to write a significant amount of code.

Using the Professional Edition, you can open, create, and manage databases and record sets programmatically. You can use both database and record-set definitions from the data control in your code; you don't have to choose one approach or the other. The database and record-set objects are similar to pointers in C, and can be simply assigned to the objects defined by the data control. Once you've done this, the data-control objects can be manipulated in code. You can also bypass the data control entirely and perform all operations through code.

When you're using a data object—whether programmatically or through the data control—the Access engine ordinarily processes the SQL statements. With the Professional Edition, you can use the "SQL Pass Through" option to specify that the query will be processed by the external database server. Alternately, you can bypass Visual Basic data objects entirely and directly call ODBC or Visual Basic SQL, the call-level API for Microsoft SQL Server. These methods will give you greater control but require a solid understanding of SQL databases. The third option—and by far the easiest—is simply to buy the Q+E MultiLink/VB library of drivers and custom controls for SQL access.

Visual Basic has a reputation as a productivity tool, and people developing database front ends want a tool that will help them complete projects quickly. But by itself, Visual Basic is not a quick and easy tool for SQL front-end development unless you're writing only the simplest of applications. The use of third-party controls can change that situation dramatically. And even after buying a full library of add-ons, you'll usually end up paying less for Visual Basic than for many other database front-end development packages.

SUITABILITY TO TASK

Microsoft Visual Basic

	POOR	FAIR	GOOD	EXCELLENT
Custom application development	●	●	●	○
EIS/DS applications	●	●	○	○
Fast application development	●	●	○	○
Cross-platform development	●	●	○	○

FACT FILE

Microsoft Visual Basic for Windows, Version 3.0, Professional Edition

Microsoft Corp., One Microsoft Way,
Redmond, WA 98052; 800-426-9400, 206-882-8080; fax, 206-883-8101

List price: \$495.

Requires: 286-based PC or better, 4MB RAM, 40MB hard disk space, Microsoft Windows 3.x.

In short: Provides all the basic tools you need to do SQL front-end development, but without

any third-party add-ons you will have to do a lot of coding. Although a GUI report writer is included, the Professional Edition of Microsoft Visual Basic for Windows lacks many of the standard features of SQL front-end development tools. There is no menu-driven query builder, and only text fields and check boxes can be bound to data without programming. Still, it is by far the least expensive alternative, and a burgeoning market of third-party controls is available to fill the gaps.

ON READER SERVICE CARD

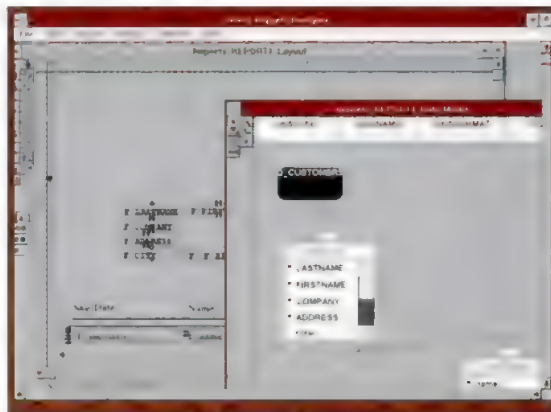
Oracle Corp.

Oracle Cooperative Development Environment

BY JOE SALEMI

Following the release of its Oracle7 SQL database server, Oracle Corp. is entering the front-end application development arena with a suite of Microsoft Windows-based tools, collectively dubbed the Oracle Cooperative Development Environment (CDE).

The CDE bundle contains the developer versions of Oracle Forms 4.0 and Oracle Reports 2.0, both of which now run under Windows 3.1 and support all the new features of the Oracle7 database server. Also included are new versions of



Oracle Reports, part of the Oracle Cooperative Development Environment bundle, uses the Data Model window for a visual representation of the relationships between the various data elements in the report.

Oracle's other Windows-based tools: Oracle Graphics 2.0, a graphing and charting program; Oracle Book 1.0, a Windows hypertext-like utility that lets developers create and distribute on-line help and reference manuals; and SQL*Plus 3.1, an enhanced interactive SQL database administration utility. The version we tested included a late beta version of Forms and shipping versions of the remaining modules. Forms 4.0 is slated for commercial release as we go to press.

CONNECTIVITY AND PRICE

Currently, applications developed using Oracle's tools will only work with Oracle7 databases or with back ends supported by

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Conner Drives Right Past Colorado.

Feature	Conner Tape•Stor 250 MQT w/Backup Basics Software	Conner Tape•Stor 250 MQT Plus w/Backup Exec Software	Colorado DJ-20
Drive Size	1" Industry Standard	1" Industry Standard	NO
Free 3M Tape	YES	YES	NO
DOS/Windows Software	YES	YES	NO
2-Year Warranty	YES	YES	NO
Full Cartridge Insertion	YES	YES	NO
Suggested Retail Price	\$179.99, with all the above, including a formatted 3M minicartridge	\$199.99, with all the above, including a formatted 3M minicartridge	\$199.99

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CONTINUES

SQL Front Ends

Products listed in alphabetical order

■ = YES □ = NO

	Gupta SQLWindows	IBM Personal AS/2; IBM Personal AS Builder/2	Informix- Hyperscript Tools for Windows	Ingres/Windows 4GL for OS/2	Microsoft Visual Basic for Windows	Oracle Cooperative Development Environment
List price (tested configuration)	\$3,495	\$3,325	\$1,495	\$1,000	\$495	\$2,500
Tested platform	Windows	OS/2	Windows	OS/2	Windows	Windows
Formats Supported						
Primary SQL back ends supported	Gupta SQLBase Server	IBM AS400, IBM DB2/2	Informix servers	Ingres Server	Microsoft SQL Server, Oracle servers, Sybase SQL Server	Oracle7
Other back ends supported	IBM DB2/2, Informix, Ingres Server, Microsoft SQL Server, Oracle servers, Sybase SQL Server	EDA/SQL, IBM DB2 (middleware required), Ingres Server, Oracle servers, SQL/D, SQL/400	None	None	Any engine with an ODBC driver	DEC RDB, IBM DB2, IBM SQL/DS, Tandem, Terradata (all through gateways)
ODBC support	□	■ (via back end)	□	□	■	□
IDAPI support	□	■ (via back end)	□	■ (via back end)	□	□
Client platforms:						
Microsoft Windows	■	■	■	■	■	■
Can act as DDE client and server	■ ■	■ ■	■ ■	□ □	■ ■	■ □
OLE support	■	□	□	□	■	□
OS/2	□	■	□	■	□	□
Unix	□	□	□	■	□	■
Non-SQL platforms:						
Xbase	■	■	□	■ (middleware required)	■ (via ODBC)	■ (through gateways)
Paradox	■	□	□	■ (middleware required)	■ (via ODBC)	■ (through gateways)
ASCII	■	■	■	■ (middleware required)	■ (via ODBC)	■ (through gateways)
Can import spreadsheet formats	■	□	■	□	□	■ (through SQL*Loader)
Can export to spreadsheet formats	■	□	■	□	□	■
Can import comma-delimited files	■	■	■	■	■ (via ODBC)	■ (through SQL*Loader)
Can export to comma-delimited files	■	■	■	■	■ (via ODBC)	■
Data Sources						
Queries database for table names	■	■	■	■	■	■
Accesses multiple sources in one query	■	■	■	■	■	■ (coding required)
Joins tables from multiple sources	■ (coding required)	■	■ (coding required)	■ (coding required)	■ (coding required)	■ (through server)
Updates multiple databases at once	■	■	■ (via back end)	□	■	■ (coding required)
Programming Features						
Supports graphical joins	■	■	■	□	□	■
Connects to 3GL modules	■	■ (custom headers required)	■ (custom headers required)	■	■	■
Constructs queries/nested queries from menus	■ □	■ ■	■ □	□ □	□ □	■ ■
User can view constructed SQL code	■	■	■	■	N/A	■
User can edit generated code	■	■	■	■	N/A	■
Supports scheduled queries	■ (coding required)	■ (coding required)	■	■	■ (coding required)	■ (coding required)
Provides ready-made forms or templates	■	■	□	□	□	□

N/A—Not applicable. This product does not generate SQL code

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much less a room. If you haven't thought of Compaq as an enterprise-critical platform before, we invite you to grab your bifocals and

begin. (We'll be cramming a lot of information into this ad, which, given how much we managed to fit into our new servers, only makes sense.)

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Now, how can you be sure our server is truly a miracle and not a mirage? To begin with, there's Full Spectrum Fault Management, provided by Compaq Insight Manager technology and software that continually monitors over 800 aspects of the server's operating status. (For example, Drive Parameter Tracking checks 15 hard-drive parameters.) All of this information is constantly gathered, analyzed and then used to prevent, tolerate or recover from system problems.



If the performance of a monitored component drops below a specified level, our unique Pre-Failure Warranty kicks in. We'll actually replace a Compaq warranted drive or memory system free. Before it stops working. No downtime. Ringing cash registers. Happy boss.*



Still, no network's perfect. In the unlikely event problems occur, our server exhibits remarkable tolerance. Every ProLiant includes Compaq-designed hot-pluggable drives. ProLiant Models 2000 and 4000 come standard with advanced error-correcting memory and off-line backup processor features (whereby the server reboots

automatically to a second processor). And, most notably, the Compaq Smart SCSI Array Controller together with the ProLiant Storage System ensures mission-critical data integrity. Should a network problem bring the server down, the Rapid Recovery Systems of the ProLiant are designed to bring it back up.

VER IS A MAINFRAME WITH AN ATTITUDE.



For example, Automatic Server Recovery 2 uses a historical record of server status and performance to perform an astonishing array of tasks. Like intelligently restarting the server, automatically correcting a variety of problems, and accessing a telephone pager to contact network administrators.

By now you'd expect us to have rethought server setup, configuration and OS installation, but you might be surprised by the results. Introducing SmartStart, a CD-ROM system that takes the headache out of getting your server up and running. ProLiant includes a CD-ROM drive and bundled CDs of optimized

Netware and other major operating systems. To get hooked up to your network operating system, simply call your dealer for an access code, enter it, answer a few questions, and leave. Minutes later—say, after you've enjoyed a cup of coffee and a jelly donut—you'll return to find an integrated OS fully installed and optimized for increased performance and improved management. And we'll keep you updated via CD when new operating system versions appear.



And finally, to accompany our new line of mission-critical servers, we're introducing mission-critical support. With ProLiant, we now offer extensive analysis, installation and service through our CompaqCare System Partners, a select group of highly trained systems experts backed by Compaq engineers. You can now choose 4-hour on-site warranty response upgrade** direct from Compaq. Again, there's our unique Pre-Failure Warranty. And, of course, all Compaq servers come with a 3-year on-site¹ warranty, and 7-day-a-week, 24-hour-a-day technical support.

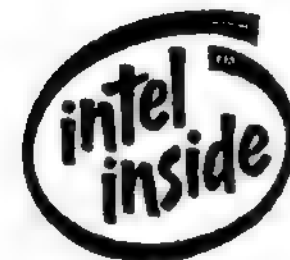


All in a surprisingly small box for not a whole lot of money. In fact, a DX2/66 Compaq ProLiant 1000 starts at about \$6000³.

Which may help to explain the look your boss gives you when he hears how much money you've saved: stunned admiration. But you'll get used to that. It goes with the territory. For more information on the new Compaq ProLiant servers, or for the location of an authorized Compaq reseller near you, just call us at 1-800-345-1518. If you'd like to receive model, feature and specification information immediately via fax, select the PaqFax option. Or, if you'd like that information even sooner, just turn the page.



COMPAQ



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ProLiant 1000

ProLiant 2000

ProLiant 4000

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<i>Architecture</i>	TriFlex/PC One Processor	TriFlex with up to two symmetric processors	TriFlex with up to four symmetric processors
<i>Network Interface</i>	Up to 12 High-Speed Channels; NetFlex 2 with Packet Blaster Technology Standard		
<i>Standard Disk Controller</i>	Integrated Fast SCSI-2 and Smart SCSI Array Controller (selected models)		
<i>Storage Capacity</i>	550MB–112GB Internal/external	1050MB–140GB Internal/external	1050MB–140GB Internal/external
<i>Typical Usage</i>	Departmental network services—primarily NetWare	Departmental network application services— NetWare, NT and Unix	Application services for preemptive downsizing— NT and Unix
<i>Transaction Rating</i>	50–150 TPS	200–300 TPS	300–400 TPS
<i>Estimated Starting Street Price†</i>	\$6,000	\$8,900	\$13,900

SERVER DEPENDABILITY AND AVAILABILITY

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<i>Fault Prevention</i>	Insight Manager alerts you to server status changes in over 800 component parameters, allowing proactive server management backed by 3-Year Pre-Failure Warranty
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<i>4-Hour Warranty Response Upgrade</i>	Optional Three-Year On-Site Warranty upgrade to 4-hour response
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APPLICATIONS DEVELOPMENT
Front-End Development Tools

► **S U M M A R Y O F F E A T U R E S**

ENDS

	Gupta SQLWindows	IBM Personal AS/2; IBM Personal AS Builder/2	Informix- Hyperscript Tools for Windows	Ingres/Windows 4GL for OS/2	Microsoft Visual Basic for Windows	Oracle Cooperative Development Environment
Programming Features (continued)						
Supports native GUI controls	■	■	■	■ (limited)	■	■
Programmer can design custom controls	■	■	■	□	□	■
Automatic field creation	■	□	□	■	□	■
Masked fields	■	■ (coding required)	□ (coding required)	■	■	■
Programmer can create child windows	■	■	■	■	■	■
Object-oriented constructs supported:						
Inheritance	■	□	□	■	□	■
Multiple inheritance	■	□	□	■	□	■
Polymorphism	■	□	□	■	□	■
IDE features:						
GUI screen painter	■	■	■	■	■	■
On-the-fly syntax checking	□	■	□	□	■	■
Context-sensitive help	■	■	□	□	■	■
4GL or scripting help	■	■	□	□	■	■
System or API help	■	■	□	□	■	■
On-line SQL syntax help	■	■	□	□	□	■
Version control	■	□	□	■	□	□
Multiple programmer support	■	□	□	■	□	□
Developer security levels	■	□	□	■	□	□
Debugging:						
Programmer can test in development environment	■	■	■	■	■	■
Interactive debugger	■	■	■	■	■	■
Breakpoints	■	■	■	■	■	■
Watchpoints	□	■	■	■	■	□
Watch variables	■	■	■	■	■	■
Step-trace execution	■	■	■	■	■	■
End User Features						
Includes statistical functions	■ (limited)	■	■	□	■	■
Supports MAPI, VIM	■ ■	□ ■	□ □	□ □	■ □	□ □
User can save snapshots of data and views	■	■	■	□	■	■
Graphics support:						
.BMP	■	■	■	□	■	■
.EPS	■	□	□	□	□	□
.GIF	■	■	■	■	□	■
.PCX	■	■	□	□	□	■
.TIFF	■	■	□	□	□	■
Print preview	■	■	■	□	■	■
Separate report writer	□	□	□	□	■	■
Built-in GUI report writer	■	■	■	□	□	■
Integrated reporting	■	■	■	□	□	□
Built-in label support	■	■	□	□	■	■
Mail-merge support	□	□	□	□	□	■
Font support	■	■	■	□	■	■
Integrated chart support	□	■	■	■ (limited)	■	■
Distribution and Technical Support						
Application distribution:						
Runtime module or DLL required	□	■	■	■	■	■
Royalty-free distribution	□	□	□	□	■	□
Free technical support	30 days	90 days	None	None	For setup only	30 days
Toll-free number	■	■	■	□	□	■

Oracle SQL*Connect gateway products (supported databases include DEC RDB, IBM DB/2, and IBM SQL/DS). The new CDE bundle is also not fully compatible with Oracle 6.0 databases. However, Oracle will soon support the Microsoft ODBC protocol, letting developers create applications for a wide range of non-Oracle back ends. Client-side ODBC drivers are slated to ship by the end of the year.

Oracle is also pursuing an aggressive cross-platform strategy. At press time, Windows was the only client platform supported, but ports of the full tool bundle are under way for a broad range of clients, including Macintosh, NeXTStep, and many Unix flavors. All are slated to ship by year's end. Applications developed on one platform will be source-code compatible with other supported platforms. Compiler modules included with each environment will be used to generate applications specific to the client.

Sold as a group, the CDE with SQL*NET bundle is priced at a hefty \$2,500. Individual tools are also sold separately. The single-user developer ver-

SUITABILITY TO TASK

Oracle Cooperative Development Environment

	POOR	FAIR	GOOD	EXCELLENT
Custom application development	●	●	●	○
EIS/DS applications	●	●	●	○
Fast application development	●	●	●	○
Cross-platform development	●	●	●	○

sions of Forms sells for \$1,250, Reports for \$1,000, Graphics for \$500, Book for \$250, and SQL*Plus for \$500. Runtime modules used to distribute compiled applications (Oracle calls them deployment products) are currently available for character-mode DOS, Windows, and WIN-OS/2, with other platforms to follow. The runtime packages cost \$100 for Book, \$300 for Forms, \$200 for Graphics, and \$200 for Reports per user. A single-client runtime bundle is \$450.

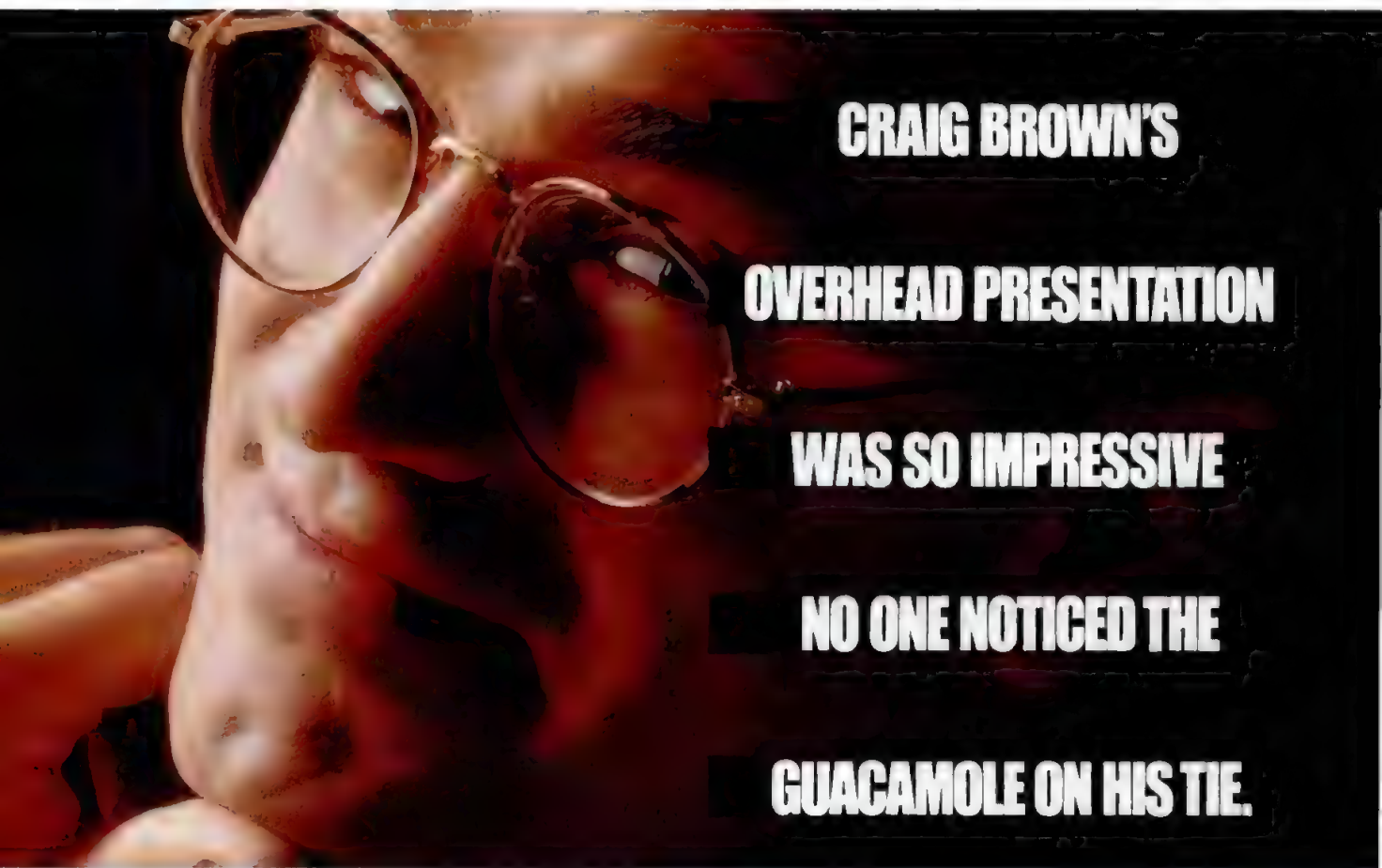
FORMS AND REPORTS

Oracle databases must be defined and created, and security rights granted,

through an interactive SQL program such as the character-mode SQL*DBA that comes with the server or the DOS or Windows versions of SQL*Plus. Once the database exists, Oracle Forms and Oracle Reports can be used to develop applications. Although you will need to be connected to your database while compiling any SQL statements, a significant amount of development work can also be done off-line. Oracle does not provide a local database engine for full off-line development, however.

Forms is the main environment for creating interactive data lookup and entry screens. It functions similarly to many Windows-based database application tools: The developer can modify a default screen that Forms creates from the structure of the database, or can create a custom form from scratch by picking the fields in the table from a pick-list. It uses the full Windows drag-and-drop capabilities, multiple fonts, and the on-screen display of graphics.

Forms uses the concept of screen blocks, where each block contains either



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OVERHEAD PRESENTATION

WAS SO IMPRESSIVE

NO ONE NOTICED THE

GUACAMOLE ON HIS TIE.

static text, graphics, or the data from a particular table. Multiple tables can be combined on the same screen through multiple blocks. Each form can also have standard or programmer-defined action buttons. The buttons can take predefined actions, or the developer can create and assign custom PL/SQL (Oracle's native extended SQL) actions to them. Forms also includes support for both internal triggers and stored procedures on the database. Internal triggers are part of the form definition and can be assigned to buttons, form events, and menus. Stored procedures can be called from inside button-action definitions or from internal triggers.

The new version of Forms also includes the functions that were previously available with the separate Oracle Menus product. User menus are created inside Forms and become part of the application definition. The programmer can compile the form with the built-in compiler for testing during the development process; it is also com-

plied when it's complete. The compiled form can then be used with the runtime package.

Oracle Reports does not come with templates, but it has a number of standard report types that can be used as is or as the basis for custom reports. The standard types are tabular, master/detail, form, form letter, mailing label, and matrix. The programmer can use drag-and-drop to move the individual items around on the screen. Graphics can be included as part of the report header or footer, or as data fields in the report itself. The report can also be previewed on the screen before sending it to the printer.

MORE TOOLS

Oracle Graphics is a Windows-based graphics and charting package that uses the data from an Oracle database to create a number of different charts, including column, bar, line, mixed, pie, double-y, high-low, Gantt, and scatter charts. The charts can be saved in a number of standard formats for use in Forms, Reports, or other Windows programs.

Oracle Book is a hypertext-like utility that lets the developer create a customized help system or on-line manual

FACT FILE

Oracle Cooperative Development Environment

Oracle Corp., 500 Oracle Pkwy., Redwood Shores, CA 94065; 800-672-2531, 415-506-7000; fax, 415-506-7150

List price: \$2,500

Requires: 286-based PC or better, 12MB RAM, 64MB hard disk space, Microsoft Windows 3.1

In short: Offers power and ease of use for users of Oracle databases. The various Oracle appli-

cation-development tools included in this bundle—Oracle Book, Oracle Forms, Oracle Graphics, Oracle Reports, and SQL*Plus—are the best available for Oracle7 database developers. When the ODBC drivers are released, developers for other database servers should certainly give this bundle a look.



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CIRCLE 362 ON READER SERVICE CARD

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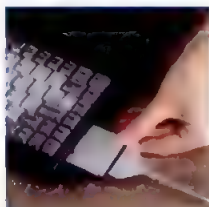
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Printer Ports
External VGA Video Port for
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Close-Up 4.0, A/C Adapter and
Carrying Case

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6.1 pounds including battery
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PCMCIA Slot, Type II
More than 2 hours of battery life*
9600 Baud Fax/2400 Baud
Modem; Free Fax/Modem
Software

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- 14" Color Ultra VGA 72Hz non-interlaced
- 5 16-bit ISA Slots

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- 212MB IDE Hard Drive

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- Local Bus IDE Interface
- Local Bus Video Accelerator, 1MB RAM
- 14" Color Ultra VGA 72Hz non-interlaced

- 5 16-bit ISA Slots
- 4 Drive Bays
- 101-Key Keyboard
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- EISA Upgrade Available
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- Built-in SCSI-2 controller
- 14" non-interlaced 72Hz HRVGA

- VLB Video Accelerator 1MB video memory (upgradable to 2MB) for 1024x768 with 256 colors
- True color capability (16.7 million colors)
- 8 32-Bit EISA Slots, 2 w/32-Bit VLB
- 4 External, 5 Internal Drive Bays
- Two buffered serial ports, one extended parallel port, SCSI port
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- Removable side panel for easy access to chassis interior
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- 33MHz, 486DX Intel Processor
- Display: 9.5" usable diagonally
- 6.5 pounds including battery
- 3.5" Internal Floppy

- PCMCIA Slot, Type II
- More than 2 hours of battery life (depending on applications, individual use and power management)
- 9600 Baud Fax/2400 Baud Modem, Free Fax/Modem Software
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- Built-in PS/2 Style Mouse Trackball
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- 3.5" Internal Floppy
- PCMCIA Slot, Type II
- 9600 Baud Fax/2400 Baud Modem, Free Fax/Modem Software

- 4MB RAM, expandable to 20MB
- Built-in Mouse Trackball
- Serial, Parallel, Keyboard and Printer Ports
- External VGA Video Port for simultaneous display
- Free MS DOS 6.0, Windows 3.1, Close-Up 4.0, A/C Adapter and Carrying Case

- 64 Grayscale Monochrome Display (edgelyt, 30mm dot pitch)
- More than 3 hours of battery life (depending on applications, use and power management)
- 5.7 pounds including battery
- 120MB IDE Hard Drive

425TXT Notebook

- Active Matrix LCD Display (640x480 resolution for 256 colors)
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for the application. The Developer version ships with on-line versions of the reference manuals for all the other Oracle development tools.

SQL*Plus isn't a development tool *per se*; it's an enhanced version of the SQL*DBA administration utility that comes with the Oracle database software. SQL*Plus is used to run SQL and PL/SQL commands and programs to administrate the database and to design, create, and modify databases.

The individual modules of the CDE bundle are not integrated to the extent that you can call the functionality of one from within another. But a single application can contain functionality created in multiple tools. Forms can act as a DDE client; DDE server and OLE capabilities will be included in the x.1 versions when they're released later this year or early in 1994.

APPLICATIONS DEVELOPMENT

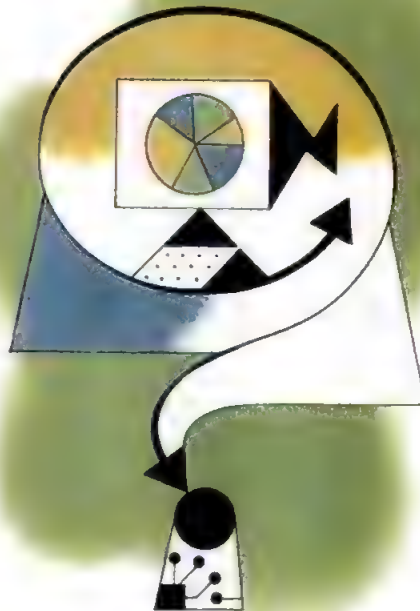
The entire set of Oracle development tools were quite easy to use during testing, though we did have to increase the RAM in our test-bed machine to 12MB in order to run them. It took less than an hour each to create the forms and reports we used for our Suitability to Task ratings.

Oracle's manuals are highly regarded as being among the best in the database industry, and the ones that come with the tools maintain that reputation. They include tutorials, step-by-step instructions, and extensive examples of how the different functions work. Buyers also get 30 days of free technical support from Oracle.

The Oracle CDE tools bundle is a fairly pricey one, although it is not the most expensive tool set covered in this roundup. At the same time, its power and ease of use help tilt the balance in Oracle's favor. If you're moving to Oracle7 or a supported third-party database, you'll definitely want to upgrade your tools and applications to the new versions. This is especially true if your organization can leverage Oracle's soon-to-be-released cross-platform products. If Oracle delivers a strong ODBC driver implementation, the product's somewhat restricted back-end connectivity will be dramatically improved.

NONPROGRAMMABLE SQL ACCESS TOOLS

SQL Access Simplified



With visual query tools and powerful report writers, nonprogrammable SQL front ends offer true end-user empowerment—without the SQL learning curve.

by Stephen W. Plain

SQL is the lead horse in client/server databases, so it's no surprise that nonprogrammers want to harness its power, too. Nonprogrammable SQL front ends make this possible, letting end users retrieve data sets or create meaningful reports on the fly—without knowing a line of SQL.

This section looks at seven nonprogrammable front-end tools that use SQL internally to communicate with the database server, while providing a graphical interface that lets users work without knowing SQL syntax.

Three of the seven vendors included in our October 12, 1993, roundup of SQL database servers have tools in this category: Gupta's Quest, Informix Software's ViewPoint, and Oracle Data Browser. We also looked at four third-party products to illustrate other user-friendly approaches to end-user SQL access: BusinessObjects, Brio Technology's DataPrism, IntelligenceWare's Iconic Query, and Q+E Database Editor.

In preparing the following reviews, we tested each package's power and ease of use in generating SQL queries, producing reports, and, if supported, creating graphs. We also examined each product's user interface to judge its paradigm and general usability. We tested their connectivity with a SQL back-end database and looked at each product's interoperability with mainstream apps via DDE (dynamic data exchange), OLE (Object Linking and Embedding), or data export and import. We also looked at any supplied DBA (database administrator) tools used for system setup.

STRENGTHS AND LIMITATIONS

As a group, these products shine at creating and issuing ad hoc queries. Most also let you generate reports from the returned data, although their abilities vary from the rudimentary to the sophisticated. A few even offer help for the administrator, like the ability to limit run-away queries or predefine joins between database tables.

Nonprogrammable SQL front ends can't handle all database tasks, however.

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The ZEOS Contenda[®] Subnotebook.

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- IDE hard drive up to 120MB.
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- 256K (386SL version) or 512K (486SL version) video RAM.
- 486SL version includes 3.3v technology for added battery life, PI local bus for Windows acceleration, high-speed floppy drive controller.
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486SL Contenda: \$1495

- 4MB RAM
- 80MB IDE hard drive

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- 4MB RAM
- 80MB IDE hard drive
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- MS-DOS 6, Windows 3.1, Lotus Organizer

486SL Contenda: \$1795

- 4MB RAM
- 80MB IDE hard drive
- External 3.5" floppy disk drive
- MS-DOS 6, Windows 3.1, Lotus Organizer



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386SL Contenda: \$1795

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- 80MB IDE hard drive
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486SL: 8K internal system cache.
- RAM expandable to 20MB (486SL) or 10MB (386SL).
- IDE hard drive expandable to 180MB.
- 256K (386SL version) or 512K (486SL version) video RAM.
- Internal 3.5" 1.44MB floppy drive.
- Serial, parallel, video and PS/2 ports.
- Supports an external SVGA color monitor with simultaneous display capability.
- 486SL version includes 3.3v technology for added battery life, and built-in math coprocessor.
- Replaceable and rechargeable NiCad battery.
- 640 x 480 VGA backlit LCD display, 9.5" diagonal, supporting up to 64 shades of gray.
- Unique tilt and swivel display.
- 81-key keyboard with built-in mouse key, "inverted T" cursor keys and dedicated Home, PgUp, PgDn, and End keys.
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- Power-saving features.
- FCC Certified Class B.
- Complete ZEOS Customer Satisfaction Package.

What do our customers want in a notebook? Not only great looks, you said, but also great power. Lightweight too, like five pounds and change. And with built-in accessories that make it the ultimate in portable power.

The ZEOS Freestyle is the direct result of discussions with our customers. For the most power, now you can choose from either a 386SL or 486SL Intel processor. We've included such features as a built-in mouse key, floppy drive and soft carry-

ing handle. And at only 5.6 pounds, you'll want to take it with you whenever you travel!

The Freestyle's perfect for frequent flyers. Because the screen floats on a smaller footprint than a normally hinged screen, you can use it without fear of the person in front of you cranking their seat back and doing a "screen crunch" on your system. And check out that great tilt and swivel display. It's one of the few notebooks that can truly be used while sitting in your lap!

PACKAGE 1

386SL Freestyle: \$1295

- 2MB RAM
- 80MB IDE hard drive
- MS-DOS 6

486SL Freestyle: \$1695

- 4MB RAM
- 80MB IDE hard drive
- MS-DOS 6

PACKAGE 2

386SL Freestyle: \$1795

- 6MB RAM
- 120MB IDE hard drive
- Custom nylon carrying case
- MS-DOS 6
- Microsoft Windows 3.1

486SL Freestyle: \$1995

- 4MB RAM
- 120MB IDE hard drive
- Custom nylon carrying case
- MS-DOS 6
- Microsoft Windows 3.1



PACKAGE 3

386SL Freestyle: \$2295

- 10MB RAM
- 180MB IDE hard drive
- Internal 2400 bps V42 bis modem with 9600 bps send/receive fax
- Custom leather carrying case
- Extra battery
- External charging stand
- MS-DOS 6
- Windows 3.1

486SL Freestyle: \$2495

- 8MB RAM
- 180MB IDE hard drive
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Incomparable Color, Unbelievable Value!

Standard with every ZEOS ColorNote 486:

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- PCMCIA slot supporting a type I, II or III device.
- 512K video RAM.
- Local bus video for super-fast 33MHz performance.
- Display: 640 x 480 dual scan color VGA backlit LCD, 9.4" diagonal, up to 256 colors.
- Supports an external SVGA color monitor at resolutions up to 1024 x 768, 16 colors or 800 x 600, 256 colors.
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- Built-in trackball.
- Replaceable and rechargeable NiMH battery.
- One serial port, parallel port, keyboard port, mouse port and external video port.
- Full power management features include Low Power mode and programmable Stand-by features.
- AC adapter with full range from AC 110-240V to DC.
- 8.54" x 11.65" x 1.5"; 5.6 lbs.
- FCC Certified Class B; UL Listed.
- Complete ZEOS Customer Satisfaction Package.

ZEOS's new ColorNote 486 starts with a powerful, reliable Intel 486SX processor operating at 33MHz—not just 25MHz like many other color notebooks. And we added local bus video for super-fast video performance. We've packed in enough power and memory to easily run Windows: 4MB RAM (expandable to 20MB), an 80, 120 or 170MB hard drive, and an 8K built-in cache—standard.

For a crisp, vibrant color VGA display, the ColorNote employs a new technological breakthrough—dual scan technology—for color that's much better than standard passive matrix, yet not as expensive as active matrix.

You get color that's comparable to that of a great desktop color monitor! What's more, your screen is backlit, 9.4 inches on the diagonal, and gives you up to 256 colors.



Color technology can drain a notebook's power. So that you can get up to three hours—and beyond—of battery life, the ColorNote uses a Nickel-Metal Hydride battery. It also comes equipped with an internal 1.44MB floppy drive and PCMCIA slot. All this—and the ColorNote weighs a mere 5.6 pounds, including the battery!

PACKAGE 1

ColorNote 486: \$2395

- 4MB RAM
- 80MB IDE hard drive

PACKAGE 2

ColorNote 486: \$2695

- 4MB RAM
- 120MB IDE hard drive
- MS-DOS 6
- Microsoft Windows 3.1
- Lotus Organizer

PACKAGE 3

ColorNote 486: \$2995

- 8MB RAM
- 170MB IDE hard drive
- Custom leather carrying case
- MS-DOS 6
- Microsoft Windows 3.1
- Lotus Organizer

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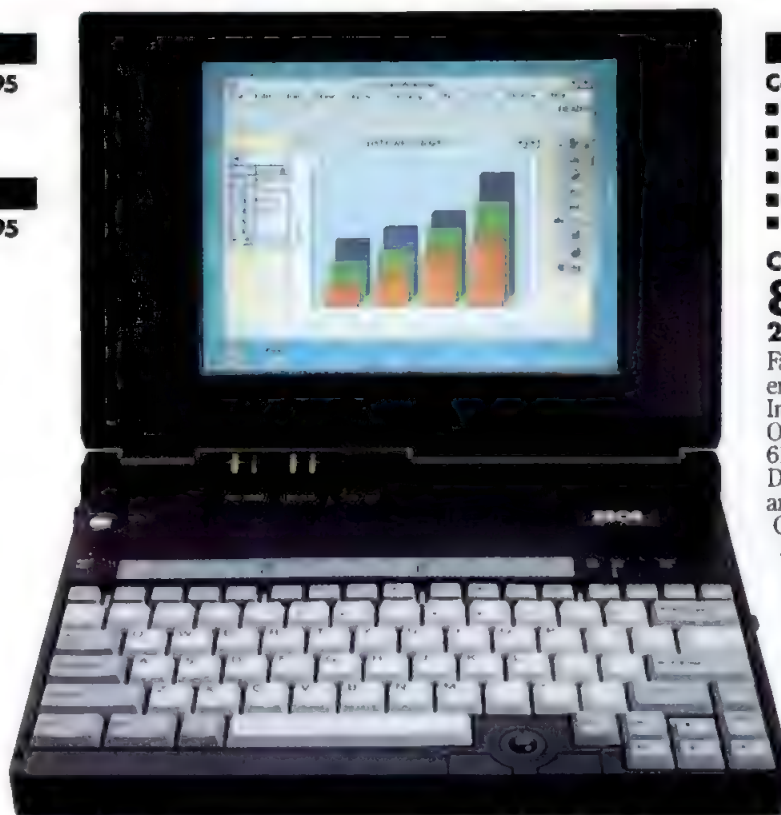
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Circle 151 on reader service card.

Nonprogrammable SQL Access Tools

FACT FILE

BusinessObjects, Version 2.2

*Business Objects Inc., 2500 Sand Hill Rd.,
#240, Menlo Park, CA 94025; 415-854-1500;
fax, 415-854-4737*

List price: \$3,495; additional workstations, \$595 each
Requires: 3MB RAM, 5MB hard disk space, DOS 4.0 or later, Microsoft Windows 3.x

Supports: DEC Rdb, IBM DB2, Informix OnLine, Ingres Server, Oracle7, Sybase SQL Server.

In short: A unique but pricey option. When properly configured by a database administrator, BusinessObjects lets users easily build even complex queries through an unintimidating point-and-click interface. Arcane field names and SQL commands are replaced by everyday business terms. But the \$595-per-user additional costs means you may have to be stingy when doling out the power.

484 ON READER SERVICE CARD

er, so data can be called from a more sophisticated graphing program such as Microsoft Excel. The next upgrade should include support for OLE.

BusinessObjects takes advantage of the client/server architecture to minimize network traffic and maximize processing at the client PC. When the server returns results from a query, BusinessObjects writes the data to an ASCII file used for all subsequent operations on that query. While cutting traffic on the network, this method is inherently snapshot-based, giving users a slice in time rather than real-time updates. Of course, queries can always be re-executed to refresh the data. An optional batch module allows users to queue high-resource queries to be run at off hours.

While BusinessObjects is a pricey option, it is unique in its ability to customize data access to the operational rules of your business while still taking full advantage of the Windows environment.

Brio Technology Inc.

DataPrism

DataPrism, from Brio Technology, is an intuitive ad hoc query tool that provides a high degree of connectivity and cross-platform compatibility. Priced at \$399 per workstation, Version 2.1 is available for

both Microsoft Windows and the Macintosh. The DataPrism interface remains remarkably consistent across both platforms, making it a good choice for companies with a mixture of both types of systems. Both packages were developed using a single Brio-developed API, and the interfaces are so identical that the documentation shipped with the Windows product uses illustrations from the Mac version.

The package offers broad database connectivity: Any server supported through DAL/DAM, DB-LIB, EDA Link, SequelLink, or SQL*NET can be accessed. There is no direct support for local dBASE or Paradox tables, however.

FLEXIBLE VIEWS

When DataPrism first loads, it provides an appropriate log-on screen for the connected database. Tables available to the user are then displayed for selection.

From within the DataPrism environment, database tables can be displayed either in an iconized view or field-list view. Unlike some other products, DataPrism also lets you view any of the available tables in a "detail" view, which displays the actual data instead of just the tables' structure. Natural joins between tables are automatically displayed.

Queries are created from the Request line, an editable text field at the top of the main window. You can drag field names from each table window up to the Request line and reorder the fields through drag and drop as well. A series of buttons lets you specify conditions and display formats for selected fields. In setting conditions for a query, you can browse the actual data for that field or specify that the condition be set interactively by the user during query execution.

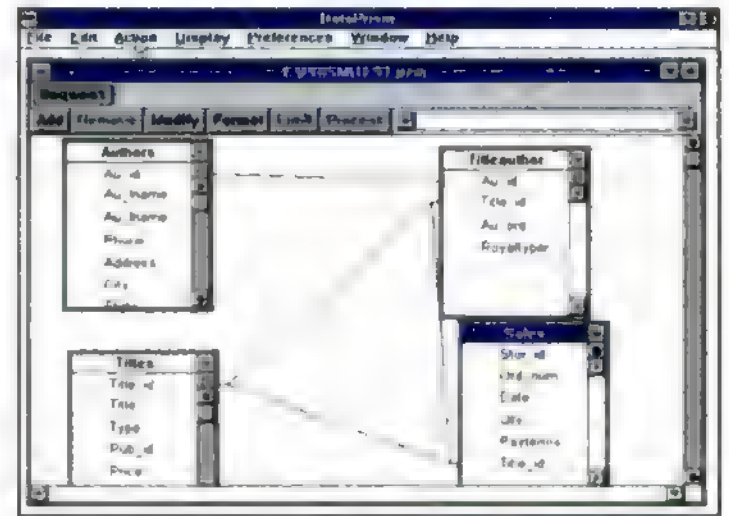
Query specifications, called "prisms," can also be saved for future use. You can create prisms that run automatically, loading DataPrism and executing via a mouse click. Prisms can also be password-protected.

FLEXIBLE FORMATTING

When you press the Process button, queries are executed; the results are displayed in tabular form in the Results window. From there, data can be formatted

using a handy toolbar. You can set breaks, change column titles, and define sort orders. Although aggregate functions on a field can be defined simply by clicking anywhere in its column and then on the appropriate toolbar button, you are allowed to perform only one calculation per column—a substantial limitation.

Reports are generated from the tabu-



This DataPrism interface on the PC is identical to the interface on the Mac version.

lar layout of the query results, but a print-preview function gives you good customization capability. Controls are offered for designing headers and footers and for setting margins. During testing, however, we uncovered a bug that wrote PostScript code to the output file, even though the Windows generic text printer driver was selected; the company is investigating the problem. Reports can also be exported to various spreadsheet and ASCII text formats.

FACT FILE

DataPrism, Version 2.1

*Brio Technology Inc., 444 Castro St., #700,
Mountain View, CA 94041; 800-486-2746,
415-961-4110; fax, 415-961-4572*

List price: \$399 per workstation.

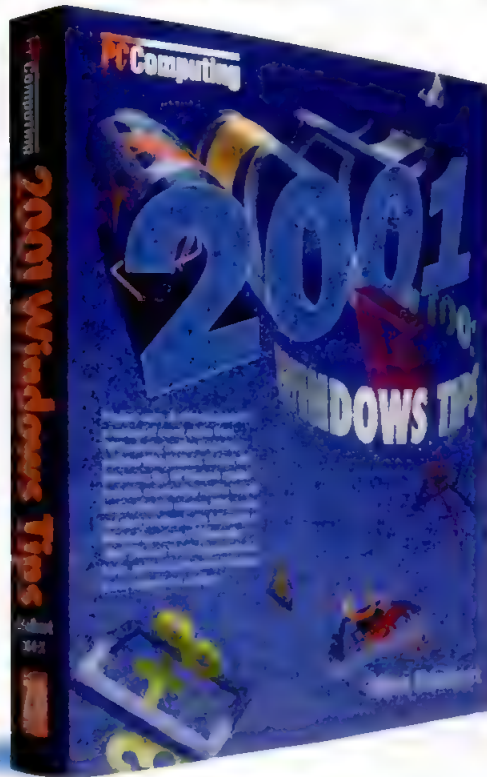
Requires: 2MB RAM, 15MB hard disk space, Microsoft Windows 3.1

Supports: All databases supported through DAL/DAM, DB-LIB, EDA Link, SequelLink, SQL*NET

In short: Available for both the Macintosh and PC platforms. Also boasting a consistent interface for each, DataPrism is the logical choice if you have clients on both platforms. You can access a huge array of SQL and non-SQL database back ends, and the package offers a range of formatting options for creating finished reports.

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Blow the doors off Windows.



ISBN: 1-56276-084-X
Price: \$27.95

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DataPrism acts as a DDE server, and Prisms can be run from other applications such as Microsoft Excel or Microsoft Word. New to this version is a scripting language that can be driven from external applications to create, modify, and output Prism results dynamically. This means stored Prisms need not be predefined but can be designed on the fly.

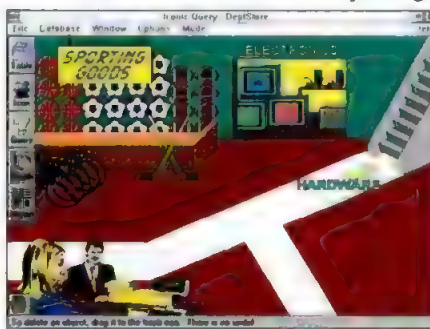
Brio Technology offers a companion product called DataPivot (\$299), which offers ad hoc data analysis. It provides a specialized interface to perform cross-tabulation and other statistical operations on data passed to it through DDE. An auto-copy option in DataPrism ensures that data is always available to DataPivot, and DataPivot can be launched from DataPrism's menu.

DataPrism is an easy-to-use tool that covers the basics of data access and reporting. Its interface is inviting and intuitive, and the package boasts strong database connectivity. Although it's a query-only tool, DataPrism is worth a serious look if your organization has a mix of Windows and Mac users.

IntelligenceWare Inc.

Iconic Query

IntelligenceWare's Iconic Query, Version 1.1, is a Microsoft Windows-based end-user tool billed as a foolproof graphical front end for querying corporate data and generating reports. While it wins kudos for offering a fresh visual approach, Iconic Query may ultimately frustrate because of its rough edges and omissions. It is available as a client/server package



With Iconic Query, users can access database tables by clicking on easily recognized images.

(\$690) for use with most major SQL databases as well as dBASE and Paradox databases. A standalone version (\$290) supports dBASE and Paradox only.

What distinguishes the product is its ability to use pictures to communicate with the user. Iconic Query lets you create an Application, essentially a picture-oriented interface showing the relationships between various tables. This Application can be viewed in either Normal mode, which displays the tables as icons with join lines connecting them, or in Pictorial Query mode, which through a series of simple bitmapped images guides the user visually. For example, an application that uses data from various departments might use bitmapped images of the actual office in each department. Smaller bitmaps can be placed on-screen to trigger navigation to another section of the application when you click on them.

While this approach seems very effective for novice database users, it involves a considerable amount of time on the database administrator's part to design and format the bitmaps. Bitmaps for each

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And our card runs the complete battery of SCSI peripherals, not just CD-ROM. Best of all, it includes one of the most comprehensive software bundles in the business and does it for a remarkable \$279.95.*

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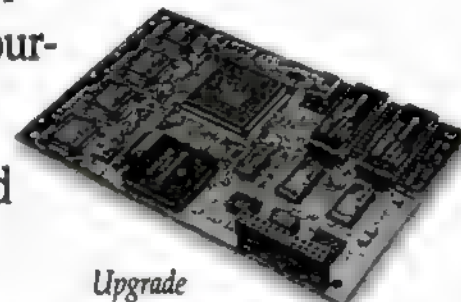
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Wave Blaster Upgradability	Yes	Yes	
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Bundled Hardware		Microphone	Microphone
Bundled Software	Monologue for Windows Creative WaveStudio Creative Soundo'LE Creative Talking Scheduler Creative Mosaic	Software Toolworks Multimedia Encycl. PC Animate Plus Monologue for Windows Creative WaveStudio Creative Soundo'LE Creative Talking Scheduler Creative Mosaic Creative VoiceAssist	Software Toolworks Multimedia Encycl. PC Animate Plus Monologue for Windows Creative WaveStudio Creative Soundo'LE Creative Talking Scheduler Creative Mosaic Creative VoiceAssist
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CREATIVE
CREATIVE LABS, INC.

Nonprogrammable SQL Access Tools

FACT FILE

Iconic Query, Version 1.1

IntelligenceWare Inc., 5933 W. Century Blvd., Los Angeles, CA 90045; 800-888-2996, 310-216-6177; fax: 310-417-8897

List price: \$690.

Requires: 386-based PC or better, 4MB RAM, 4MB hard disk space, Microsoft Windows 3.1.

Supports: IBM DB2, Microsoft SQL Server, Oracle7, Sybase SQL Server, dBASE, Paradox.

In short: A fresh approach but still has some rough edges. As its name implies, Iconic Query lets you construct a query through pictures representing data structures, making it well suited for novice users. Basic charting capabilities are included as well. But limitations and oversights in this version may convince you to wait for a later release.

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screen have to be created individually and dynamic links to the underlying database operations defined.

The difficulty is underscored by the fact that most of the sample applications

shipped with the product have no pictorial views associated with them. A further limitation is that icons for stored queries, reports, and graphs cannot be put directly into an application diagram, the visual representation of your data.

WHAT'S INCLUDED

Iconic Query's interface consists of a simple vertical toolbox, an application workspace, and a series of windows that provide access to iconized representations of tables, queries, applications, reports, and graphs. Queries are constructed through a series of context-sensitive menus that appear as you click on table icons.

Basic charting functionality, with several two-dimensional and three-dimensional graph types, is built-in. Formatting control is not particularly strong, however. For example, you cannot select a range of data from a query-result window to chart; the charting engine automatically charts all rows in the window. There is also no support for DDE or for exporting result sets, making it tough to get your data to a more sophisticated charting package.

Iconic Query's report writer generates a columnar report format from the active query in the Data Browser window. Basic formatting options for each object are available through a toolbar. Though not an extremely powerful report writer, it offers an unintimidating interface. Pre-defined graphs, icons, and bitmaps can be inserted into report formats. A WYSIWYG preview mode is also available.

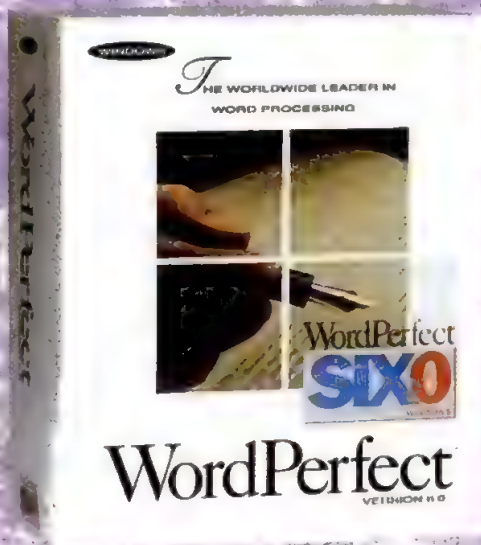
In addition to standard reports, the mailing-label option handles basic Avery label formats. A self-explanatory dialog box allows you to create custom labels, and it visually shows you which dimension you're modifying, based on a picture of a portion of a mailing label sheet.

WHAT'S MISSING

Although Iconic Query's interface is easy to understand and its basic operations are intuitive, there are still some rough spots. One of the most obvious is the Data Browser window's lack of a standard Windows Edit menu and its associated clipboard functionality: There is no support for cut, copy, or paste. Another is

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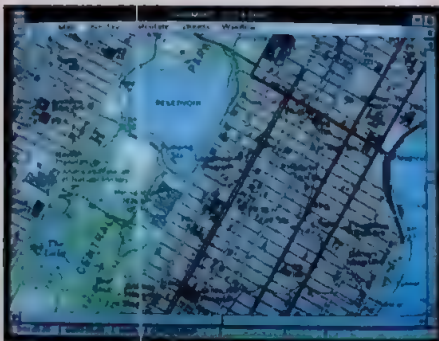
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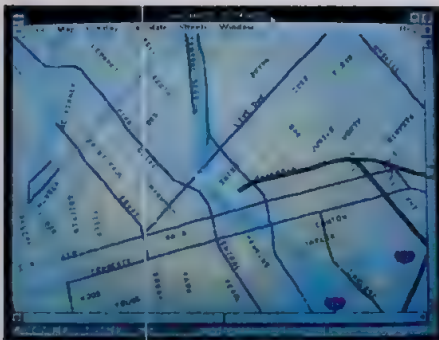
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Nonprogrammable SQL Access Tools

related to Iconic Query's table maintenance. Local dBASE tables can be created, but if you forget to define a field, there is no direct way to change the schema. You must create a new table by using the structure of the first as a start, and then overwrite the original.

Iconic Query is a mixed bag of attractive interface elements and underdeveloped features. IntelligenceWare is planning a future upgrade that will smooth many of the rough edges and offer additional interapplication features.

Oracle Corp.

Oracle Data Browser

As the name implies, Oracle Data Browser is a query tool that offers browse-level access to Oracle databases and any database supported through Oracle Open Gateway (a separate purchase). Priced at \$599, both Microsoft Windows and Macintosh versions are available. Compared with the other front ends we looked at, Version 1.0 of Data

Browser demands considerable knowledge of database structure and terminology. Even though there's no programming language to learn, you need to be fairly proficient with database structures.

SOME SMARTS REQUIRED

The Data Browser interface presents the user with two main windows: the Query window and the Results window. The Query window displays a graphical representation of tables and fields included in the current query. As with IntelligenceWare's Iconic Query, tables can be iconized or expanded to list all of their fields. The Results window gives you a spreadsheet-like view of the data, similar to that in Brio Technology's DataPrism.

Creating a query in Data Browser is fairly straightforward for any user proficient in databases, but it is not necessarily intuitive if you lack such knowledge. From a pick list of database tables, you first select the ones you want displayed as "datasources" in the Query window. The graphical representations of those tables appear with symbols beside each field to

FACT FILE
Oracle Data Browser, Version 1.0 Oracle Corp., 500 Oracle Pkwy., Redwood Shores, CA 94065; 800-672-2531, 415-506-7000; fax, 415-506-7150
List price: \$599. Requires: 4MB RAM, 4MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.1. Supports: Oracle7, databases supported by Oracle Open Gateway. In short: Database knowledge required. Unlike with some of the other products we looked at, users must have a good grasp of the structure of their database to make use of Oracle Data Browser. Also, it is intended to be a query-only tool, as the formatting options for generating reports are limited. Still, if you have an Oracle database and are not intimidated by database constructs, Data Browser is handy to have around.
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indicate whether it's a number field, text field, or long text field. Data Browser also shows the predefined joins as connections

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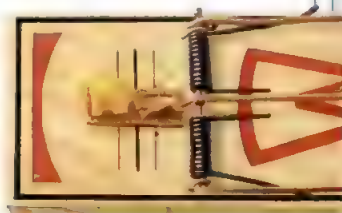
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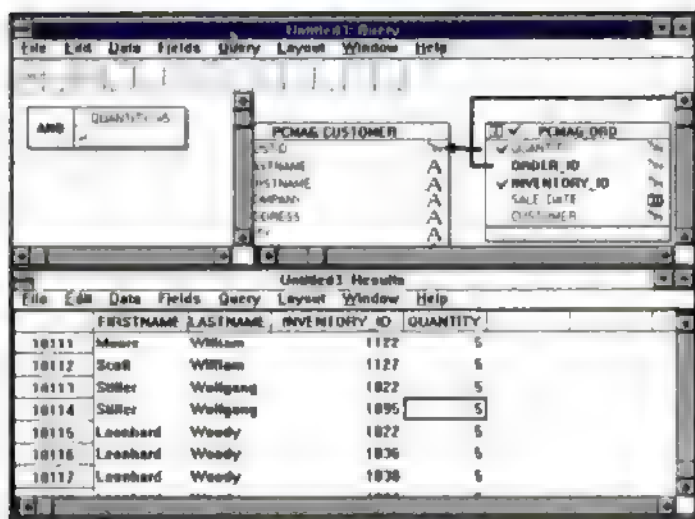
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Nonprogrammable SQL Access Tools



Data Browser is an effective query tool, if you know database structure and terminology.

between fields of different tables.

While this graphical representation is accurate, a query with more than two tables will almost certainly present an image too big to display on the screen at one time. Experienced users can sidestep the problem by opting to work in the Results window and switch to the Query window only when they need the visual representation of the database schema; the basic data fields and query menus are available in both the Query window and the Results window.

The next step in the query process involves selecting which fields to display in the Results window. In addition to the existing fields, Data Browser lets you define calculated fields; 56 built-in functions are available. From the menus you then select sort orders, grouping, break fields, and summary information. These are active in browse mode but are especially useful in report generation. An option also lets you specify whether the current query is to be reexecuted automatically as soon as you've made any changes, or reexecuted manually, avoiding unnecessary network traffic.

Although the Results window is very similar to the interface used by DataPrism, Data Browser offers superior control over groupings and aggregate functions. You can assign multilevel breaks to fields, which will automatically display the data in logical sections, with lines separating each. If you apply one or more aggregate functions to fields within the sections, they are automatically calculated and displayed at the end of each group. Unfortunately, you have no control over where these lines appear; the labels are always shown indented from the left.

NO GLOSSY REPORTS

A more serious formatting limitation is that you can only define a single font for the whole window. You can boldface, italicize, and underline individual columns, however. Still, you probably won't want to rely on Data Browser as a report writer, as the same simple display you see in the Results window is what you get as a finished report. A simple print-preview feature is available but lacks both a zoom capability and the ability to access the printer setup.

Data in the Results window can be copied to the Windows clipboard or exported to most common formats. From there you can get your data into a package that offers more robust formatting and charting facilities. There is currently no OLE support within Data Browser.

Data Browser expects to be connected to an Oracle database. Since the optional Oracle Open Gateway product essentially makes other vendors' databases appear as though they were Oracle's, this means queries can be performed by Data Browser on a number of back ends (albeit without exploiting certain syntactical subtleties of non-Oracle servers).

If you access an Oracle database (or use Oracle Open Gateway), you'll probably want to have Data Browser handy. The product is well documented and is a useful tool for end users who are somewhat knowledgeable about their databases.

Q+E Software Inc.

Q+E Database Editor

When it comes to end-user front ends, you won't find one with more database connectivity out of the box than Q+E Database Editor, Version 5.0. The package offers a graphical view into database formats ranging from local Paradox and dBASE files to a host of client/server SQL databases—all from an easy-to-use point-and-click interface that remains consistent, no matter which database you're accessing. Q+E lists for a very reasonable \$299, and Microsoft Excel users (who get a scaled-down version of Q+E with Excel) can upgrade to the full package for \$99.

End users work with data tables

through spreadsheet-like child windows within Q+E's multiple-document interface. The rows and columns in these grids can be manipulated easily. You can use a mouse to move and resize columns, and change column headings from the default database field name to more meaningful labels.

The Query Builder in Q+E is a single screen that shows the tables, fields, sort orders, and conditions you've selected for

FACT FILE

Q+E Database Editor,
Version 5.0

Q+E Software Inc., 5540 Centerview Dr.,
#324, Raleigh, NC 27606; 800-876-3101,
919-859-2220; fax, 919-859-9334

List price: \$299.

Requires: 2MB RAM, 4MB hard disk space, Microsoft Windows 3.x

Supports: AS/400, Btrieve, dBASE, Gupta SQLBase Server, HP-Allbase/SQL, HP Image/SQL, IBM DB2, Informix OnLine, Ingres Server, Microsoft Excel, Microsoft SQL Server, NetWare SQL, Oracle7, OS/2 DBM, Paradox, Progress, SQL/DS, Sybase SQL Server, Tandem NonStop SQL, Teradata, XDB; text files.

In short: Great connectivity, great price, easy to use
Q+E Database Editor is a mature product that can be used for all your corporate data-access needs. Though it doesn't offer native charting functionality, it does offer a variety of options that let you export retrieved data to whatever package you wish. Also, its interactive SQL window is great for learning basic SQL syntax. This product belongs on your short list

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the query. A mouse click on any of these regions brings up a specialized dialog box for redefining the selected element. Most of the query definition is done by moving selections from one list box to another and by selecting radio buttons. Although the process is very logical and straightforward, users will have to know at least the basics of the database structure they are accessing to define a new query: Q+E accesses data strictly by table and field names.

SQL SYNTAX HELP

Connected databases can also be queried using standard SQL statements through the SQL dialog. But unlike other products, which merely present the user with a



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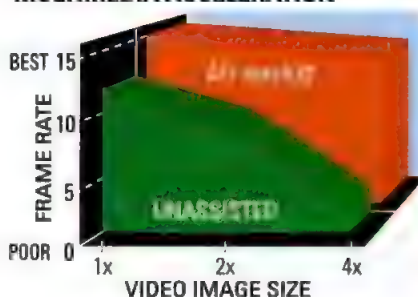
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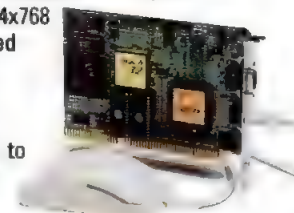
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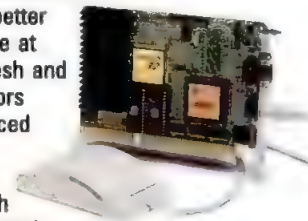
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Nonprogrammable SQL Access Tools

prompt and expect the proper syntax, Q+E helps you by offering syntax templates for each SQL statement and an example of its use. Using templates, you only have to fill in the bracketed prompts for each desired clause. When you do make an error, a fairly detailed error message is displayed. The syntax for each SQL command is adequately documented in the manual, and there is a separate chapter pertaining to specific information for each of the supported databases.

As an alternative method of accessing data, Q+E offers a Form view. Each win-

dow that contains a data table automatically displays a corresponding single-record form with buttons for adding and editing records. Though not a full-blown form designer—you can only modify basic elements such as the position, size, and style of the form's controls—it's still more than most competing packages offer.

A generous toolbar puts the most commonly used operations such as queries, sorts, copy and paste, and printing just a click away. You can even add your own icons to the toolbar and attach a single operation or multiple operations to it, using Q+E's documented commands. This list of commands is also accessible from other applications via the DDE Execute command, and can be used to perform database operations and reformat the Q+E workspace. Icons can be designed to trigger complex query-and-report operations with a click of the mouse.

Q+E is not a sophisticated report writer, but it offers basic control of a report's page layout. Also, Q+E doesn't have any charting capabilities. You can, however, pass result sets to your favorite

report writer or graphing package through the Windows Clipboard or by saving the results to a data file. Q+E also offers robust DDE functionality.

Q+E is a cost-effective, easy way to access corporate data stored in a variety of formats. The product is mature and well documented, and it serves double-duty as an effective tool for learning the fundamentals of SQL.

Gupta Corp.

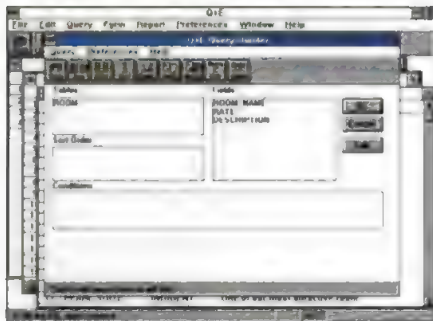
Quest

Quest, Version 2.0, appeals to both the Microsoft Windows end user and the SQL developer. The \$595 standalone version combines substantial querying and reporting power with an easy-to-use interface. It also comes with a single-user version of the Gupta SQLBase for Windows database management system. Connectivity to other remote servers is available but only with the appropriate Gupta router.

Quest's toolbar contains buttons for each of the five "activity" modules available to the user: Table, Query, Report, Catalog, and SQL. When opened, each activity becomes a child window in Quest's multiple-document interface and may be minimized to an icon or resized at will.

The Table activity lets the user create a table or browse and update an existing one. Using the Query activity, the process of defining a multitable query in Quest is quick and intuitive. Simply point and click to indicate the tables and fields you wish included in the query. Quest automatically generates a graphical representation of the links between tables. These links can be easily modified by sliding the connector bars to the appropriate column, and outer joins can be established simply by double-clicking on the handle on the appropriate side of the link. After establishing links, the data from the columns is returned. You can then optionally establish additional sort orders, column selections, and conditions.

At any time, you can view the SQL statements Quest generates automatically and copy them to the Clipboard. This also offers developers a quick way to define complex queries and copy them into a SQLWindows application. For power users comfortable with SQL syn-



Building queries in Q+E is straightforward; a toolbar puts common operations a click away.



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Nonprogrammable SQL Access Tools

tax, the SQL button on the toolbar lets you manipulate the database directly via SQL statements.

The Report activity in Quest provides a flexible banded report writer; end users



Using the Query activity, defining a multitable query in Quest is quick and intuitive.

can define reports for the developer to incorporate into a SQLWindows application. The end user designing a report template needn't know the specific structure of the database; he or she can use descriptive labels where data should appear. The developer can later link those aliases to the appropriate data. The

report writer supports two-pass totaling and offers a sophisticated cross-tabulation facility.

The Catalog button gives browse access to the system tables of the attached database. It also lets you define and modify tables, views, and indexes. For security, Quest relies primarily on the rights of users defined in the SQL database, but a couple of options do exist on the front end. During installation, you can specify that only local tables can be modified. You can also instruct Quest to prompt the user for a user name and password upon the first connection to a database.

MORE BUTTONS IN THE WORKS

Since this current version of Quest has no charting capability, you must use another application to chart the results of queries, either by copying and pasting the data or through a DDE link. Quest functions as a DDE server, allowing users who are proficient at writing macros in other applications to launch queries and retrieve information into their application automatically without ever entering

Quest. Quest also offers well-implemented OLE facilities.

As we went to press, Gupta was readying Version 2.1 of Quest for release. This version will include Pinnacle Publishing's Chartbuilder, which offers a flexible

FACT FILE

Quest, Version 2.0

Gupta Corp., 1060 Marsh Rd., Menlo Park, CA 94025; 800-876-3267, 415-321-9500; fax, 415-321-5471

List price: \$595

Requires: 4MB RAM, 6MB hard disk space DOS 3.1 or later, Windows 3.1

Supports: Gupta SQLBase Server, HP-Allbase AS400, IBM DB2/2, Informix OnLine, Microsoft SQL Server, NetWare SQL, Oracle7, Sybase SQL Server, Supra

In short: Easy to use and powerful Quest's five-button toolbar gives quick and intuitive access to all the functions you need. And the next version will include Pinnacle Publishing's Chartbuilder, which will round out the package.

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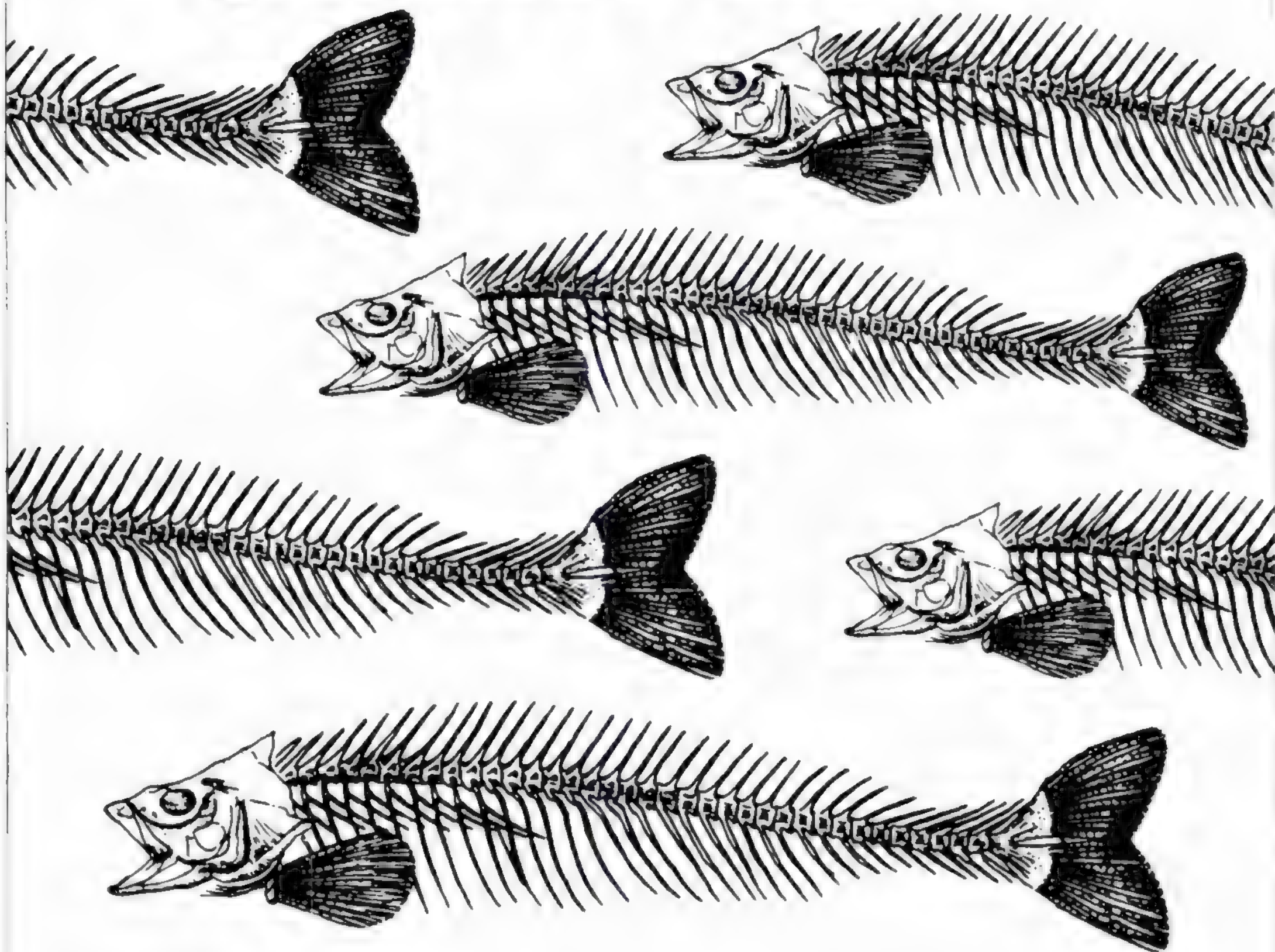


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charting engine for Quest data. Another enhancement in Version 2.1 is the capability to design custom data entry forms that use such graphical objects as pull-down list boxes and check boxes.

Since Quest is strictly a Windows product, it isn't a cross-platform solution. It is, however, an excellent end-user reporting and querying tool with substantial interoperability with both mainstream business applications and the SQLWindows development environment. Once the new charting capabilities are added, Quest will be tough to beat.

Informix Software Inc.

ViewPoint

With ViewPoint, Version 1.0, Informix Software provides end users with a Microsoft Windows-based tool offering impressive query generation, forms design, and reporting facilities—but for Informix SQL databases only.

Although ViewPoint is available as a standalone product priced at \$595 (which includes the required I-Net networking software), the same functionality is included in Informix-DBA, the database administration toolkit used to create and modify Informix database schemes. In fact, the work an administrator does in Informix-DBA ultimately determines how easy it will be for end users to access data in ViewPoint. Using Informix-DBA, the administrator creates SuperViews, which define relationships between database tables, specify user and resource limits, provide sort specifications, and handle other database details.

Most important to the ViewPoint user, the administrator uses SuperViews to establish English aliases for tables and columns. The DBA can establish SuperViews that encompass information from multiple tables but are named as the end user would think of them—Invoice or Revenue, for example.

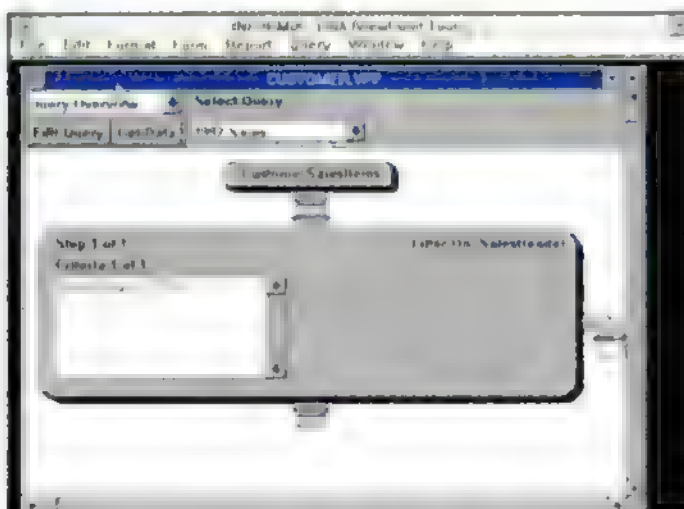
WORKING WITH FORMS

ViewPoint is inherently forms-based, providing a default form layout that can then be altered to fit your needs. When SuperViews are used to represent structures involving multiple tables, the forms created in ViewPoint automa-

tically appear in a master-detail paradigm—a single customer record with multiple order records, for example. To create such a form, you simply select the SuperView and then the fields and expressions defined within it. When the default form is created, the master record fields are placed at the top, and detail fields are laid out in a scrollable region below. ViewPoint's ability to detect a one-to-many relationship and create an appropriate form is a powerful feature. It predicts the way users want to view the data and insulates them from the job of defining the multitable form.

ViewPoint also lets you create completely customized forms with its impressive variety of drawing and formatting tools. Tool palettes let you create various shapes, including irregular polygons and arcs, as well as define patterns, colors, and alignment characteristics. BLOB (binary large object) fields containing graphics or text can be inserted into both form and report layouts.

To create a query, you use the query-by-form method of placing example criteria such as a customer name in each field of a form within the Query editor. These forms, or Query Cards, can be stacked to create multiple query operations, and a Query Overview mode gives a graphical representation of the query. In addition to entering examples in the Query editor, you can enter SQL commands. You can also place complete SELECT statements within the field to generate subqueries. Although ViewPoint only allows browse-access to data, a DBA can give users the right to place locks on a SuperView record, ensuring that no updates are performed until you're finished with the data.



ViewPoint's Query Overview mode displays query conditions, replete with graphical pipe fittings.

EXCELLENT REPORT WRITER

The report designer in ViewPoint offers substantial flexibility, both in the look and the logical structure of the report. The package's control over formatting page headers and footers is exceptional. Icons are provided to create headers and footers for every page, even- or odd-numbered pages, or the top and bottom of

FACT FILE

ViewPoint, Version 1.0

Informix Software Inc., 4100 Bohannon Dr., Menlo Park, CA 94025; 800-388-0366, 415-926-6300; fax, 415-926-6593

List price: \$595 (includes I-Net networking software)

Requires: 386-based PC or better, 8MB RAM, 8MB hard disk space, VGA or Super VGA monitor, DOS 3.1 or later, Microsoft Windows 3.1.

Supports: Informix OnLine 4.x, Informix-SE 4.x

In short: For Informix database users only. The initial work done by your database administrator largely determines how easy to use ViewPoint will be for end users. But the plain-English aliases for complex concepts and multitable queries the DBA sets up will empower end users, and ViewPoint offers one of the most flexible built-in report writers in this roundup. If you have an Informix back end, ViewPoint is a logical choice.

ON READER SERVICE CARD

pages when groups are broken up. Such functionality puts ViewPoint on a par with products specifically designed for report writing, and allows you to create professional-looking, presentation-quality reports.

The one weak spot is ViewPoint's lack of interapplication communication: It has no built-in support for OLE or DDE. While there is an option to export data, it only supports exports to delimited ASCII text files. Since ViewPoint lacks a built-in charting capability, you have to export data as text to your favorite charting package. Informix plans to expand ViewPoint's database support to include ODBC servers and also to port the package to the Macintosh and Motif.

This release of ViewPoint offers an impressive degree of flexibility. Its report writer is top-notch, and if the SuperViews are set up properly, accessing even complex databases is a snap. If you're an Informix user, ViewPoint should be a serious consideration. □



Network Edition

THE LATEST NETWORK PRODUCTS AND MANAGEMENT TECHNIQUES

Unix or Windows? A Question of Scale

New Windows-based management consoles hold great promise for workgroup managers, but potential pitfalls should keep enterprise managers wary.

by Jill Huntington-Lee

What does *scalability* really mean? That seems to be the biggest question on the lips of today's network management vendors. With yesterday's workgroups converging into today's enterprise networks, the ability to support growing networks is the key to finding the right network-management product for the right environment.

Unfortunately, vendors are using the term *scalability* very differently. Some are referring to the ability to move their platforms to a faster processor. Others mean they distribute the work of monitoring the network across multiple devices. Really, both of these are important.

With the emergence of low-cost

Windows-based management consoles from companies such as Novell, Intel, Microcom, and HP, scalability is becoming the key differentiator between

Windows-based products and Unix-based management stations from Cabletron Systems, HP, IBM, NetLABs, and Sun-Connect.

Like the Unix-based management consoles, the Windows-based consoles are, naturally, built around the most popular independent network management scheme: the Simple Network Management Protocol (SNMP). With SNMP, these consoles are able to gather information from any network device that contains an SNMP agent, which is a small piece of code inside the device that gathers internal statistics and information (see the sidebar "SNMP Defined" in this article).

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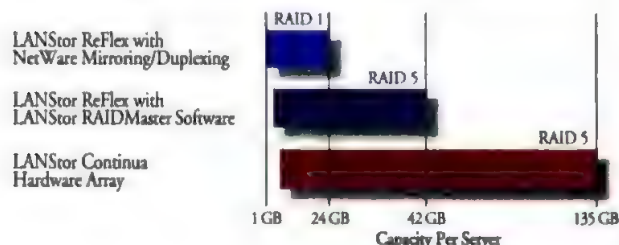
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And like the Unix-centric vendors, the Windows vendors are also racing to define the right mix of applications programming interfaces (APIs) with which developers can create management applications for these consoles. Alliances are key here, so HP and Intel are teaming up in order to port Intel's LANDesk Manager to OpenView, and Novell is working with a number of vendors, such as hub vendor SynOptics, in order to develop management applications for its Network Management Station (NMS).

To counter this offensive, Unix heavyweights such as SunConnect, for example, are banking on third-party applications to extend their reach down into the desktop. IBM is about to announce applications for its Unix-based NetView/6000 manager that will monitor and control OS/2 systems and Token-Ring LANs.

What these changes mean for you, the network buyer, is a confusing marketplace full of products with tremendous potential. You'll find a wide selection of management tools that will pose a dilemma for many people: Save thousands of dollars and deploy Windows-based SNMP management stations, or pay the price and gain some more functionality with the Unix platforms.

Even the 1,000/10,000 rule (which says that a Windows-based management product is enough for 1,000-node networks, while a Unix station can handle up to 10,000 nodes) isn't much help, for no one management product can do it all.

WHAT TO LOOK FOR

While all vendors claim that their products are scalable, true scalability is a different story. In general, scalability can be divided into seven different areas.

Cooperation. The range of tools needed to manage any given LAN is far too

broad for a single company to produce: hardware inventory, software inventory, server analysis, software distribution, network analysis, trouble ticketing, and the

New York and you generally want a manager in California to worry about the networks there, the two management platforms they use should be able to share

information using what's called *manager-to-manager communication*. But in the first version of SNMP, manager-to-manager communication is not offered, leaving companies either to create a proprietary communications protocol, use the Common Management Information Protocol (CMIP), or force managers to waste valuable WAN bandwidth by sharing screens with the X Window protocol. A second version of SNMP, SNMP-2, will offer manager-to-manager communication but is currently not widely available.

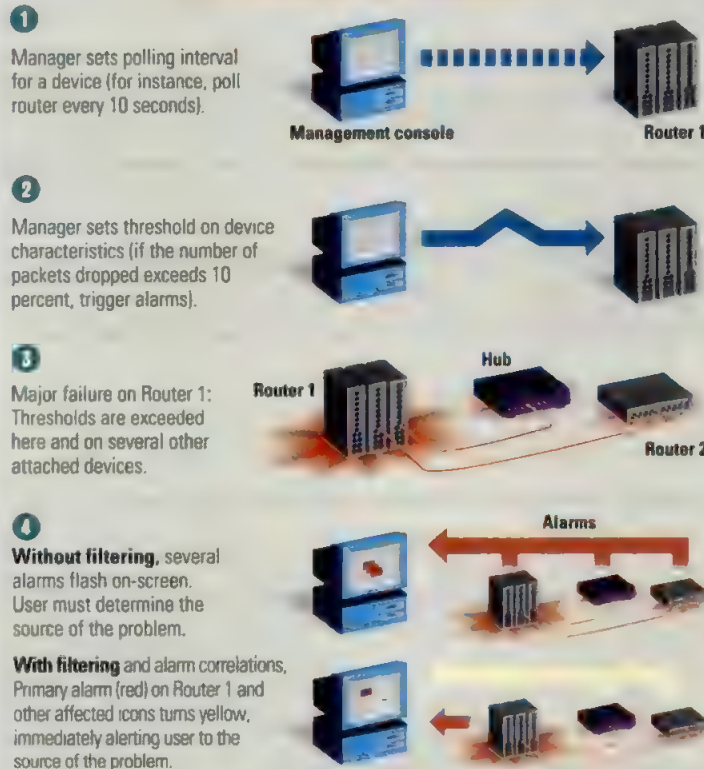
Database type. The type of database that these network management platforms packages use is also crucial. A truly scalable management station employs a distributed

database, allowing network managers to distribute data without duplicating information or creating excessive management traffic overhead. Having an architecture that allows the dissemination of network management data across the network to be scaled from a small workgroup to an enterprise network isn't sufficient, though.

Domains. The responsibilities for managing the network must also be able to scale. Often, senior network managers offload routine tasks or user calls to junior operators—or, different operators may be responsible for monitoring different portions of the network. Here, limiting the scope of what an individual operator can do or see to a single domain is usually preferable. Ideally, management systems should allow flexible creation of domains to match the organization's business model.

Discovery mechanism. Beyond distributing the responsibility of managing the

The Polling/Alarm Sequence



*Network buyers face
a confusing marketplace
full of products with
tremendous potential,
including a wide range of
management tools.*

cooperate with other management utilities.

Communication. To manage multiple sites, a package must be scalable in how it addresses the needs of today's complex LANs and internetworks. If you are in

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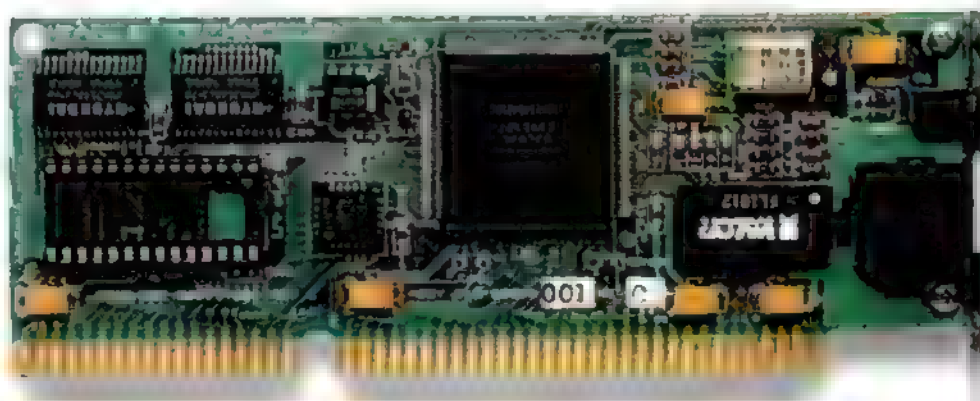
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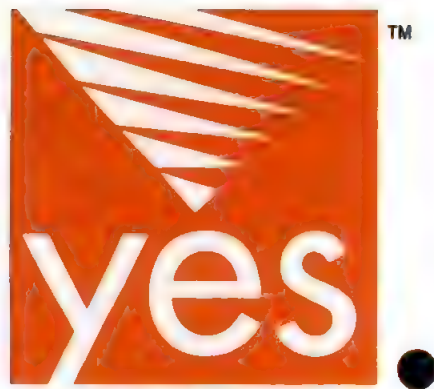
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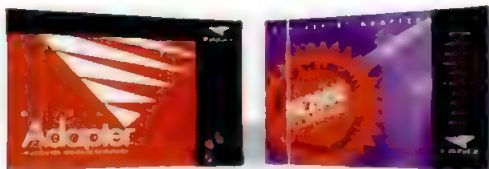
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network, enterprise management systems must be able to discover and show IP and IPX devices.

In small workgroups, this is a boon, but in large networks you may not want to discover everything at once, much less display it all on a screen. Thousands of nodes can mean a pretty jumbled network map. Most discovery mechanisms allow the user to depict the network on a segment-by-segment basis. The good ones can depict the network without degrading the management station's performance noticeably. They can also discover new nodes continuously and offer map-editing tools that allow operators to move groups of objects on the screen.

Alarm filtering. Scalability also includes how you permit and restrict alerts triggered from these devices from reaching the management console. Processing and filtering out alarms is especially important since alarm messages grow exponentially as the network increases in size and complexity.

There is no question that being able to run on a faster processor is important, but there's more to filtering than processor speed. The best solution allows network managers to specify certain traps (alarms) or alerts to ignore based on predefined conditions. Ideally, the network management system should correlate alarms from different sources and suppress secondary alarms, allowing only the primary cause of failure to bubble up for display on the console screen.

Polling mechanism. To reduce the amount of traffic traveling over the wide area network, polling devices for data should be a distributed task. Management consoles should be capable of offloading polling to a server or a proxy agent. A proxy agent is a special management agent that receives requests from a management station, polls the relevant devices for the right information, processes those requests, and then forwards the results to the management station. To save the network manager time, the polling mechanism should allow the manager to configure a poll for groups of objects, not require the configuration of each device poll individually.

Finally, in smaller workgroups, it may be possible for a LAN administrator to

■ The Seven Clues to Finding Scalable Network Management Platforms

○ "Not invented here" syndrome—

Network management needs are diverse. Be on the lookout for management platforms that won't allow you to run third-party applications or to function as a third-party application on top of either a Windows- or Unix-based platform.

● **Alarms out of control**—Growing networks generate lots of alarms. The management console should offer a sophisticated filtering mechanism that allows you to filter traps or alerts and then correlate the remaining alarms from different sources to allow only the primary cause of failure to bubble up for display on the console screen.

○ **Inflexible polling**—Be wary of products that force you to configure separate polls for each device in a large network. You should be able to configure these polls on a group basis—poll all routers every 10 seconds, for example—and apply Boolean operands to polled results for optimal performance.

● **Discovery overload**—Forcing network managers to show all devices on a network can be almost comical in an enterprise network. Look for discovery mechanisms that allow you to locate devices on a segment-by-segment

basis. Once they are drawn, you'll find being able to move groups of nodes around on a map very helpful.

○ Managers that can't talk—

Enterprise networks contain too much network-management data for one station. Look for stations that can share information among multiple operators to share the same X Window display. Better still are those that use the Common Management Information Protocol or proprietary protocols to pass data between stations. Even better are distributed databases, which we should first see from NetLABs' new product, OverLord, expected by early next year.

○ **No domains**—When managing a large network, you should be able to assign rights to network management operators. This will allow you to divide the management among many people, giving each control of their own domain.

○ **What, no database?**—A master database is crucial when you're trying to track more than 50 nodes on the network. Look for a SQL-based database that makes simple queries on 500 hosts an easy task.

keep a mental checklist of all the workstation and device configurations. But after a point—say, above 50 nodes—this becomes impossible. Accessing a database of information is much easier than querying individual devices for performance history and configuration data. With SQL facilities, performing a simple query on 500 hosts in just a short amount of time is easy.

A truly scalable management product performs well in these specific functional areas. Customers who understand what scalability really means in a network management solution are better prepared to weigh tradeoffs between current product functionality and future requirements.

NOVELL'S NMS

Novell's NetWare Management Station (NMS) is the leading Windows-based management platform. However, its dominant position will soon come under fire. Hewlett-Packard is currently retooling its HP OpenView for Windows, long popular with OEMs, to ship as a platform for end users by mid-1994.

Novell is marketing NMS as more than just a tool for monitoring local NetWare servers. According to Navindra Jain, vice president and general manager of Novell's Network Management and Inter-networking Products Division (NMIPD), Novell sees NMS as a way to also monitor internetworking devices.

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Jain noted that a Unix management system that centralizes management is less powerful than a Windows-based system capable of distributing the mapping, database, and alarm-processing duties across multiple servers.

But some NMS users are not totally convinced. "Novell NMS doesn't scale well because of the Windows limit," said John Shortall, network architect for Air Canada. Shortall said NMS can get saturated, depending on the number of traps (alarms) coming in and what you're trying to do on the screen.

Running a full discovery of the network can take several hours at the least. Even once the nodes and devices have been discovered, NMS's map-editing features are somewhat clumsy, as you can't move groups of objects. Finally, NMS does not provide multiconsole support in the current release; nor is the concept of management domains supported.

Despite these limitations, many users find NMS the best product in its class. "A balanced system with adequate memory,

multiple adapters, multiple controller cards, data striping, and hard disks is key to making a Windows-based solution upwardly scalable," said Andy Kiolbasa, coordinator of end user computing for ITT Fluid Technology in Morton Grove,

Adequate memory, multiple adapters and controller cards, data striping, and hard disks are key to making a Windows-based solution upwardly scalable.

Illinois. "Even then, a Windows-based system like Novell NMS is still more cost-effective than Unix," he countered.

ITT Fluid Technology is currently using NMS to manage 13 NetWare servers at eight different locations all

interconnected via frame relay. "I can manage 20 routers or more under NMS in this configuration," Kiolbasa stated.

Kiolbasa attributes this success to the way ITT has configured NMS. "You can't load NMS on the normal office server and expect good performance. We're using one 486 PC with a 66-MHz clock and 16MB of RAM for the NMS console. The key is 32-bit bus-mastering EISA cards. The more adapters you use to segregate your hardware, the better," Kiolbasa explained.

ITT uses another 486 with a 33-MHz clock and 24MB of RAM, which is located on a 130-workstation LAN, as a dedicated NMS server. "We've installed two adapters in that server—one going to the LAN and another going to the router," said Kiolbasa.

Kiolbasa is quite confident that this setup will serve him well, even when he quadruples the number of servers monitored by NMS, but others aren't so confident. "I think it would be in Novell's interest to support SNMP more fully,

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including the Host MIB and the forthcoming Desktop Management Task Force (DMTF) specifications," said Frank Belland, senior communications consultant at Martin Marietta Corp. in De Bary, Florida. The DMTF is working to standardize access to PC-component data from external management platforms.

Belland said it would be helpful to users if Novell would also provide a full SNMP MIB for NetWare and then sell value-added applications that store, analyze, and display that MIB data. "I may use Novell NMS on a local segment," he said, "but as a corporate standard, I want an industrial-strength product—one with the largest third-party following that will result in value-added applications at the least cost." According to Belland, HP OpenView is the best industrial-strength product currently available.

According to Belland, Novell's reluctance to provide a NetWare management application that would run under HP OpenView or similar platforms is just

another instance of the "not invented here" syndrome (Novell Inc., 800-429-7000).

HP OPENVIEW FOR WINDOWS

Amidst the Windows/Unix debate, Hewlett-Packard is taking no risks. Its

*By adopting
Visual Basic,
Hewlett-Packard
will encourage
a flood of third-party
applications.*

aim is to corner the market for both Windows- and Unix-based network management platforms. So far, Hewlett-Packard has created a great deal of momentum with its Unix-based version of HP OpenView. While there are also

thousands of copies of HP OpenView for Windows installed as well, they are sold under OEM labels such as Cabletron's Remote LANView/Windows.

Hewlett-Packard plans to change that in 1994, however, when it starts selling an end user version through its value-added reseller channels. That version of HP OpenView for Windows will include improved communications with the HP OpenView for Unix product as well. But the product's biggest draw is its inclusion of Microsoft Visual Basic as a development environment to encourage a flood of third-party management applications.

The bottom line is, of course, that instead of making Windows versus Unix an either/or proposition, Hewlett-Packard wants to bring back the days of one-stop shopping.

For right now, however, integration between Hewlett-Packard's Windows-based and Unix-based management systems is limited to forwarding alarms. The same is true for linking other Windows- and Unix-based management

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CIRCLE 854 ON READER SERVICE CARD

TECHNOLOGY SPOTLIGHT

SUMMARY OF FEATURES

Products listed in alphabetical order

■ YES □ NO

	Cabletron Systems Inc. Spectrum	Hewlett-Packard Co. HP OpenView for Unix, Version 3.2	Hewlett-Packard Co. HP OpenView for Windows, Version 7.2	IBM Corp. IBM NetView/6000	Intel Corp. LANdesk Manager
Product type	Unix-based management console	Unix-based management console	Windows-based management console	Unix-based management console	Windows-based management console
Targeted function	Internetwork management particularly with Cabletron devices	Internetwork management	Product-specific management	Internetwork management particularly of AIX RS/6000 workstations	PC administration/user support
Scalability:					
Low end (50 to 100 nodes)	Poor; too expensive	Poor; too expensive requires third-party product for PC and NetWare management	Very good; not too expensive, right feature set	Poor; too expensive; no PC or NetWare management support	Excellent; very affordable; strong PC-user support
Midrange (100 to 2,000 nodes)	Fair; too expensive	Very good; right features and third-party applications	Poor; not enough third-party applications	Excellent; lots of features, good third-party applications, nice filtering	Fair; no third-party applications, no network mapping
High end (2,000 or more nodes)	Very good	Fair; lacks distributed architecture; no manager-to-manager communications	Poor; limited integration with other management systems, limited filtering, no multiconsole support	Good; runs on more powerful processors and supports distributed polling	Poor; no multiconsole support, filtering, or domain support
Integration	Third-party applications (6) and device-specific application developed by Cabletron	Third-party applications (over 35)	Third-party applications: forwards alarms to HP OpenView Unix	Third-party applications (about 20); can forward alarms to NetView/390	Third-party applications; alarm forwarding to HP OpenView for Windows
Alarm filtering	Suppresses secondary alarms; filters can span groups of objects; alarms based on Boolean logic, filters	Does not suppress secondary alarms or alarm filtering	Does not suppress secondary alarms; supports alarm filtering, but only based on alarm severity and device type	Does not suppress secondary alarms; filters alarms based on Boolean logic; can filter by groups of objects	Does not suppress secondary alarms; allows alarm filtering based on severity; does not support Boolean operands
Polling	Console- and proxy-based polling (proxy requires Cabletron hub); polls can be configured for groups of objects	Console-based polling; polls cannot be configured for groups of objects	Console-based polling; polls cannot be configured for groups of objects	Console- and client-based polling; polls can be configured for groups of objects	Workstation-based polling; polls must be configured for individual objects
Discovery process	Discovers IP devices; supports auto-discovery	Discovers IP nodes; supports auto-discovery	Discovers IP and IPX nodes; supports auto-discovery; uses NetWare diagnostic services to find IPX devices	Discovers IP devices; supports auto-discovery	None
Multiconsole support	■	■ (through X Window)	□	■ (through X Window)	□
Manager-to-manager communication	■	□	□	■ (requires the AIX Systems Monitor/6000 and customization effort)	□
Domains	■	■	□	□	□
Price	SpectroSERVER \$10,000, SpectroGRAPH client, \$5,000, SNMP module, \$3,000, device modules, \$1,000 to \$3,000 each	Network Node Manager, \$15,000, HP Operations Center: 12-nodes, 32-users, \$14,500, 260-nodes, 170-users, \$152,000	Runtime license, \$595, developer's kit, \$2,500; application builder, 1,000	Base price, \$15,650, Systems Monitor/6000, \$750	Licenses priced per server, 1 server, \$1,495
Sample price per node:					
50 nodes	\$440/node (2 device modules)	\$300/node	\$12/node	\$300/node	\$30/node (1 server)
100 nodes	\$240/node (2 device modules)	\$150/node	\$6/node	\$150/node	\$15/node (1 server)
250 nodes	\$88/node (2 device modules)	\$60/node	\$2/node	\$60/node	\$12/node (2 servers)
1,000 nodes	\$28/node (5 device modules)	\$15/node	\$1/node	\$15/node	\$15/node (10 servers)
10,000 nodes	\$6/node (2 Spectrums, each with 10 device modules)	N/A	\$1/node	N/A	\$15/node (100 servers)

N/A - Not Applicable. Multiple copies of the software are needed to manage this number of nodes

products, although that capability is most often provided by third-party applications running under the Unix-based management software.

HP OpenView for Windows has limited alarm filtering and somewhat inflexible polling capabilities and does not provide multiconsole support or manager-to-manager communication. However, HP is

counting on third parties to develop applications to fill many functional gaps (Hewlett-Packard Co., 415-857-1501).

MICROCOM LANLORD

Microcom LANlord is designed for workstation monitoring and runs on an OS/2 server that boosts polling performance. "We have LANlord configured

to poll workstations every 15 seconds," said ITT's Kiolbasa, "It's outrageously fast and produces very little traffic overhead."

Microcom just started shipping an SNMP proxy agent that allows LANlord to pass management data to any SNMP management console, such as SunNet Manager, HP OpenView, or IBM

Microcom Inc. LANlord, Version 2.0	NetLABs NetLABs/Manager	Novell Inc. Novell Network Management Station	SunConnect SunNet Manager
Windows-based management console	Unix-based management console	Windows-based management console	Unix-based management console
PC workstation monitoring	Internetwork and product-specific management	Internetwork management and NetWare server monitoring	Internetwork management
Good, a little expensive	Fair, expensive, no PC or NetWare monitoring	Very good, portable, provides excellent NetWare monitoring and strong third-party support	Fair, expensive, no PC or NetWare management
Excellent, lots of features, multiconsole and domain support	Very good, very flexible polling	Good, supports device discovery and mapping but in alarm filtering no Boolean operands	Very good, third-party applications, very affordable
Fair, strong manager-to-manager communications and SNMP integration, no Boolean filtering	Very good, strong domain support and manager-to-manager communication	Fair, lacks multiconsole support, limited filtering capabilities	Fair, can distribute polling and supports Boolean logic in filters, requires a lot of third-party applications
Third-party applications; alarm forwarding to any SNMP console, links in beta for Novell NMS and LAN NetView	Third-party applications (5), alarm forwarding to other NetLABs/Managers	Third-party applications (under 10)	Third-party applications (over 50)
Does not suppress secondary alarms, allows severity, type, date, time, and status, does not support Boolean operands	Does not suppress secondary alarms; supports alarm filtering and Boolean operands	Does not suppress secondary alarms, allows alarm filtering based on severity, does not support Boolean operands	Does not suppress secondary alarms, alarm filtering, supports Boolean operands
Workstation-based polling, polls must be configured for individual objects	Console-based polling, polls can be configured for groups, objects, and conditional states	Server-based polling, polls must be configured for each object	Console- and proxy-based polling, polls must be configured for each object
Discovers all clients with LANlord agents, supports auto-discovery as stations connect to the LAN	Discovers IP nodes and all active nodes in seconds, supports auto-discovery	Discovers IP and IPX nodes, supports auto-discovery, discovery process on a large network (250 nodes) can take a very long time	Discovers IP nodes, does not support auto-discovery
■	■ (through X Window)	□	■ (requires third-party application)
■	■	□	■ (requires third-party application)
■	■	□	□
1 to 50 users, \$2,499, 51 to 100 users, \$4,999, 101 to 250 users, \$8,999	NetLABs Manager, \$12,500; NetLABs/100 (up to 100 nodes), \$5,000	NMS console, \$4,995, server agents, \$300 to \$495 each	Site license, \$3,995
\$50/node	\$100/node (1 NetLABs/100)	\$110/node (1 server)	N/A
\$50/node	\$50/node (1 NetLABs/100)	\$55/node (1 server)	N/A
\$36/node	\$50/node (1 NetLABs/100)	\$24/node (2 servers)	\$16/node
\$36/node	\$17/node (1 NetLABs/100 and 1 NetLABs/Manager)	\$10/node (10 servers)	\$4/node
\$36/node	\$17/node (10 NetLABs/100s and 10 NetLABs/Managers)	\$7/node (assuming 100 servers, 5 NMSs)	N/A

NetView/6000. Also, a LANlord/Novell NMS integration module is now in beta testing at customer sites.

To boost LANlord's ability to cooperate with other management systems even further, Microcom is working with IBM to develop a new version of LANlord for IBM LAN NetView environments that will utilize both LANlord applications

and LAN NetView services.

Although LANlord's alarm filtering and polling mechanisms are slightly better than those provided with NMS, they are still somewhat limited. LANlord does provide multiconsole support, however, and includes a protocol for manager-to-manager communications. The product is also quite easy to install, which is

important in a growing network.

Adding users is fairly automatic, noted Don Meyers, systems analyst for Morgan Keegan, a securities investment firm. He is satisfied with LANlord's ability to scale. "If you modify the login script, LANlord will check to see if the LANlord agent is loaded. If it's not, LANlord will automatically load it."

As in other Windows-based packages, which tend to be more often distributed across the enterprise, manager-to-manager communication is an advantage in this product. LANlord implements a proprietary protocol to accomplish this objective (Microcom Client-Server Technologies Group, 914-968-2300).

INTEL LANDESK MANAGER

LANdesk Manager's primary strength is PC user administration. It is also an extremely affordable product. However, its limited alarm filtering and polling mechanisms and lack of multiconsole support are typical of low-end products. Intel does, however, plan to support alarm forwarding to HP OpenView for Windows by the end of the year and to HP OpenView for Unix in 1994.

"We looked at LANdesk Manager as a natural outgrowth of LANSight, which we consider the best value in PC management software today. For a little over \$300, I can avoid walking over to the user for 80 percent of the calls," noted Dan Winkelman, manager of computer systems at the Cleveland Clinic Foundation's Division of Medicine and Surgery. The clinic's network of over 550 users is spread across a campus of six city blocks, which means a 20-minute walk across campus to handle a support call in person.

Scalability for Intel means addressing from subnet to Internet. It's comforting to a LAN administrator to be able to buy a lot of functionality at a low price.

Winkelman offered some advice to organizations shopping for a network management solution. "You can't make a decision on a product simply on dollars and cents alone. There are a lot of intangibles. Intel's service and customer orientation make LANdesk Manager an ideal package. I wouldn't hesitate to buy from Intel again." (Intel Corp. Networking, 503-696-8080.)

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SUNCONNECT SUNNET MANAGER

SunConnect's SunNet Manager was the first Unix-based platform to garner widespread support from third-party applications developers. With a Remote Procedure Call (RPC)-based, distributed architecture that is highly flexible, and an affordable \$3,995 price tag, it's easy to see why SunNet Manager currently leads the Unix-based management platform market with over 10,000 licenses sold to date.

SunNet Manager provides alarm filters that are defined at the proxy agent. The product can suppress related event messages but it does not cross-correlate event traffic. However, SunNet Manager's distributed proxy agents can be used to monitor types or groups of devices in a localized fashion, offloading polling from the central console.

And while SunNet Manager may not provide detailed PC analysis, it has other critical features. "It's true that SunNet Manager doesn't help us with PC administration at all. However, it allows us to look at the whole network, including the NetWare servers, to tell us what's up and functioning," said Doug Ruby, network manager at Chipcom Corp.

Ruby evaluated Version 1 of Novell NMS, but felt the software platform wasn't mature enough for the company's needs. "You need real-time. You have to put a lot of memory in these machines. There's lots of polling going on. When

you're polling every 30 seconds to 5 minutes, the 16MB useful memory limit in Windows is not enough for a network the size of ours."

Ruby said he finds SunNet Manager's polling mechanism to be quite flexible. "It's easy to program SunNet Manager

*When you're polling every
30 seconds to 5 minutes,
the 16MB useful memory
limit in Windows
is not enough for a network
the size of ours.*

to do things based on polling. Other network management systems aren't as tailorable. With SunNet Manager, I can take any variable in an MIB and poll at any rate I want, apply Boolean operators to the values and initiate action based on the results."

On the other hand, managing traps with SunNet Manager is not so easy. "Whereas you know in advance the format of an MIB variable to configure the poll, you don't know in advance what a trap is going to look like before it arrives. It's hard to preprogram for that. I'd like to see SunConnect improve trap manage-

ment in SunNet Manager." As an outgrowth of this experience, Chipcom is now implementing the ability to disable traps in its hubs to alleviate trap overload.

SunNet Manager's discovery process can be run on a segment-by-segment basis; a 200-node network can be discovered in 5 to 10 minutes, according to SunConnect (SunConnect, 415-960-1300).

HP OPENVIEW FOR UNIX

The Unix version of Hewlett-Packard's HP OpenView has gained momentum among third-party developers over the past year, lending a boost to its viability as a full-function, scalable management solution. While there are currently about 35 third-party applications shipping today on HP OpenView (compared to over 50 running on SunNet Manager), that number is expected to double before the second quarter of 1994, according to a recent study published by Faulkner Information Services in Pennsauken, New Jersey.

This momentum is due to HP's continued enhancement of the product, HP OpenView's excellent developer's kit, and the Open Software Foundation's inclusion of some HP OpenView technology in the OSF's Distributed Management Environment (OSF/DME).

HP OpenView for Unix is scalable in some aspects, but not in others. Curiously, Hewlett-Packard does not view alarm fil-

■ SNMP Defined

The number one prerequisite for scalability is interoperability—any network management package worth its salt must be capable of communicating with a wide variety of multivendor hardware and software components on the LAN as well as with other management software. Today, the universal language for exchanging management information is the Simple Network Management Protocol (SNMP).

In just five years, SNMP has risen from an experimental technology for managing routers and gateways on the Internet to become a worldwide de-

facto standard now supported by all types of network components.

SNMP is based on a manager-agent paradigm, whereby a compact piece of code called an *agent*, residing in a network device, responds to simple requests for information from a manager or management station. Each agent supports a virtual database of management data called a *management information base (MIB)*, which includes both standard elements (such as MIB I, MIB II, RMON, HOST MIB, and others defined by the Internet Engineering Task Force) and

vendor-specific data called *extensions* or *private MIBs*.

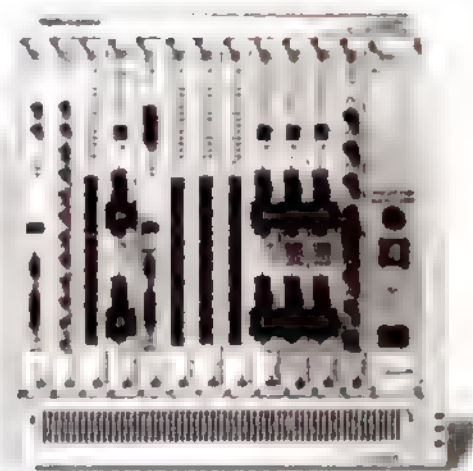
Today, SNMP managers are typically classified as either *platforms* or applications that run on a platform. In the network management industry, the term *platform* refers not to hardware but to a software package that provides a basic set of management services, including alarm capability, network device discovery, network mapping, support for SNMP and other management protocols, and application programming interfaces for integrating value-added applications.

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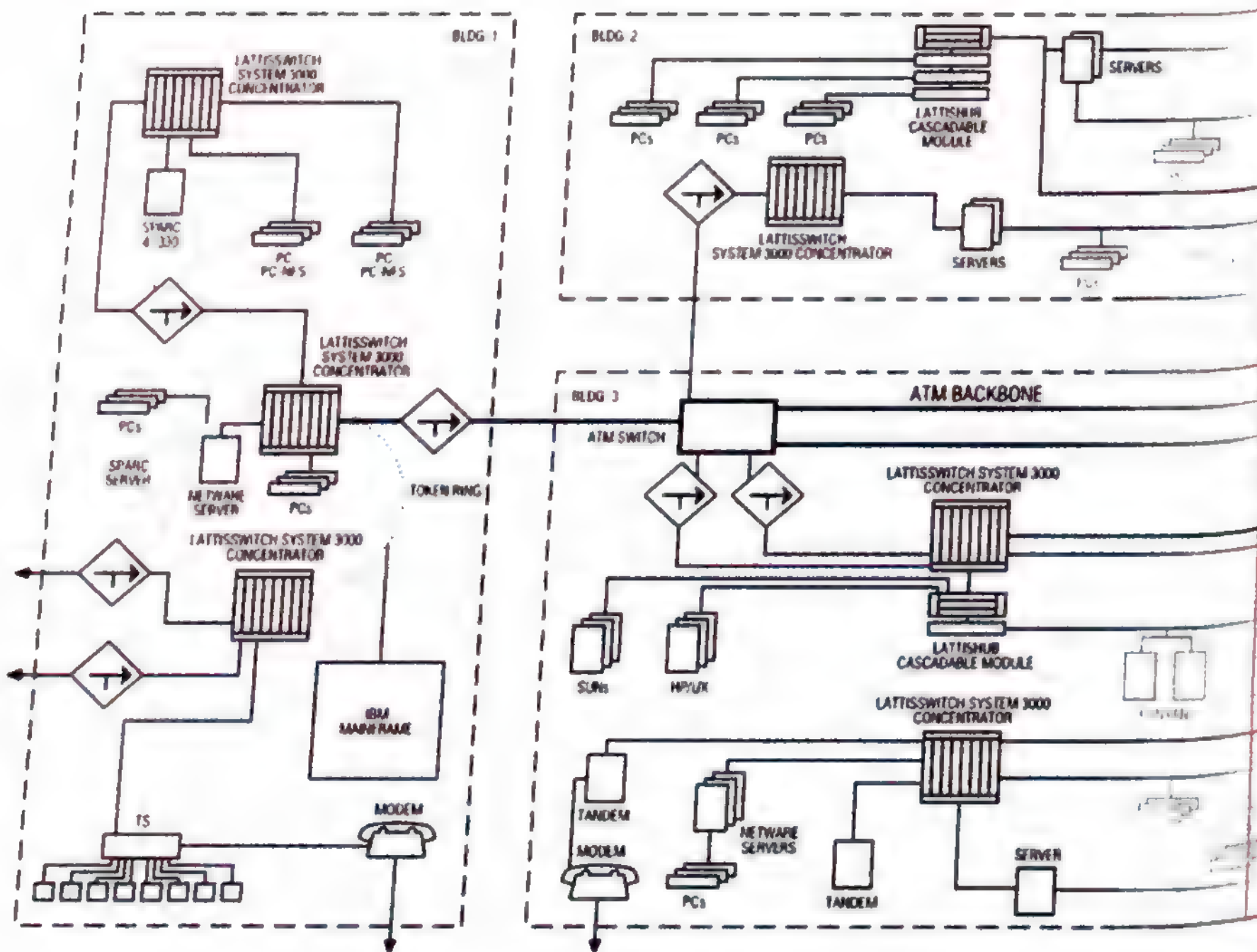
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tering as a platform function, but leaves the task to third-party applications. Two HP OpenView applications—HP Network Node Manager and HP OperationsCenter—provide multiconsole support. HP OpenView supports shared management among multiple copies of OpenView only via X Window. HP OpenView does not support manager-to-manager communication, although the vendor has promised support when SNMP-2 is incorporated into the product.

HP OpenView does, however, support an application called StationView, developed by Peregrine Systems for integrated PC monitoring. This gives Hewlett-Packard a distinct edge in bringing together the separate worlds of DOS and Unix under one management umbrella. However, the eventual alignment of HP OpenView for Windows and HP OpenView for Unix (including the exchange of management data and consistent user interface) will probably propel the HP OpenView product line into the forefront of scalability.

"The ideal scalable solution can define, store, and present information about a network management device in a completely standardized way from the

workgroup on up to the enterprise management station," said Bill Leavy, marketing manager PC Software Division of Hewlett-Packard. "Also, the product should support a distributed implementation: the option of having the database

*The ideal scalable solution
can define, store, and
present information about
a network management
device in a completely
standardized way.*

local or remote." This distributed capability will be a feature of HP OpenView products in the future (Hewlett-Packard Co., 415-857-1501).

IBM NETVIEW/6000

About two years ago, IBM decided to jump-start its entry into the Unix-based platform market by licensing HP OpenView, which formed the core of

IBM NetView/6000, Version 1. However, Version 2 of the product, which began shipping in June, includes several IBM-developed enhancements that significantly improve the product's scalability.

First and foremost are added alarm filtering and polling capabilities. NetView/6000 supports filtering rules that can span multiple objects simultaneously; users can monitor changes in object's states in different groups and use complete Boolean expressions to define thresholds. Users can also configure polls for groups of objects and examine the states of multiple components simultaneously.

Even more important for large networks of workstations is that NetView/6000 supports distributed polling using Systems Monitor/6000 agents on RS/6000s, offloading monitoring and automation functions and feeding only processed events and data to centralized NetView/6000s.

Frank Mooney, consulting director of network technologies for Blue Cross/Blue Shield of Maryland, said he feels that NetView/6000's role as an integration point is a key advantage. There are currently about 20 third-party applications shipping today that run on NetView/6000, and that number is expected to double within a few months. Although IBM currently positions NetView/6000 as an inter-network management platform, the vendor plans to offer the product on much more powerful RS/6000 hardware in the near future.

"SNMP is resource-intensive by nature," explained Sanjiv Ahuja, manager of AIX NetView/6000 product development at IBM. "You need to look at the underlying hardware involved that can limit upward scalability, such as CPU, storage, etc. When we provide a solution for large networks, we're often looking at 30,000 or more resources to be managed."

In the meantime, both third-party developers and customers are noticing a new energy behind the IBM NetView/6000 effort—symbolized, perhaps, by the late-August announcement that Digital Equipment Corp. would essentially abandon its efforts to market DECmcc/Polycenter as a management platform and, instead, resell IBM NetView/6000. IBM's product may, indeed, be the network management product story

Inside the Management Console

A management platform provides a basic set of services that act as a shell. Inside the shell are applications designed to manage specific network devices (such as routers, PCs, and concentrators) or processes (such as trouble ticketing and network security).



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yes
It runs with
NetWare

of 1994. Customers such as Mooney are noticing this revival. "I've received superb support from IBM while implementing NetView/6000," said Mooney (IBM Corp., 914-765-1900).

NETLABS/MANAGER

NetLABs, a small company, is relatively unknown outside network management circles. However, its flagship product, NetLABs/Manager, is sold through OEM agreements to a number of large companies including AT&T/NCR, Gandalf, Siemens-Nixdorf, and NKK of Japan. What NetLABs Manager lacks in name recognition, it makes up in features that enhance product scalability.

In particular, NetLABs/Manager features a highly flexible polling mechanism based on a conditional-state model. All SNMP managers will poll a device to determine the number of packets dropped—and trigger an alarm if a threshold is exceeded. However, it is not unusual for spikes in dropped packet values to occur, which may not warrant

alarms. To account for this condition (and others like it), NetLABs/Manager lets the user configure a poll so that if a threshold on packets dropped is exceeded, the system sounds an alarm. Thus, if connection speeds normalized within, say, 15 seconds,

Manager-to-manager communication is an important aspect of scalability. You have to be able to compartmentalize polling and filtering.

the condition would return to normal. However, if packets continue to be dropped, an alarm would be triggered.

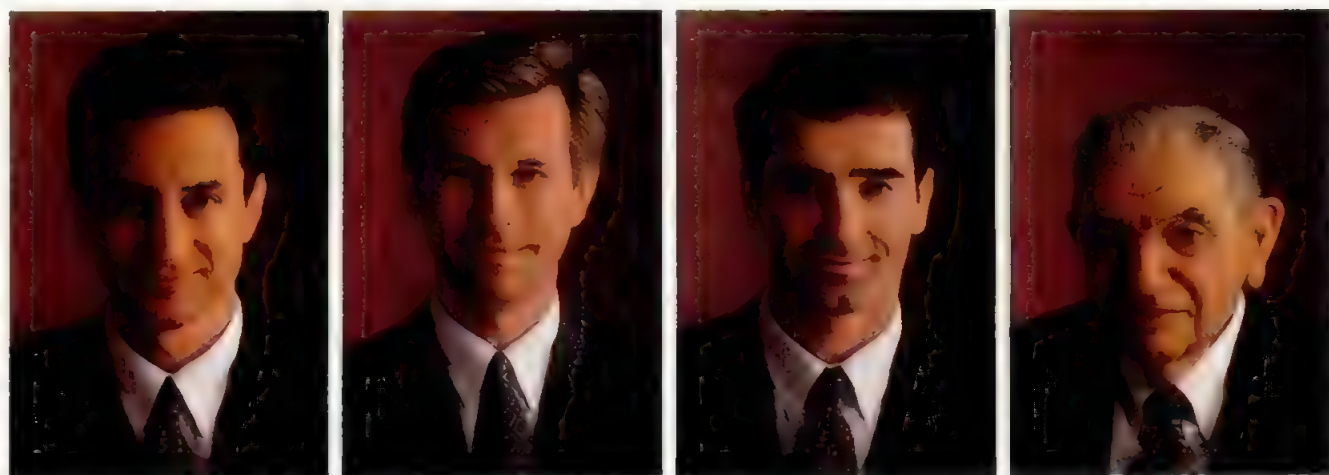
NetLABs/Manager also provides a configurable discovery feature for sweeping either the entire address range or just a

piece of it—or only those devices that have recently been used. NetLABs/Manager also supports manager-to-manager communication based on the CMIP standard. "Manager-to-manager communication is also an important aspect of scalability," said Carole Krall, senior product manager at NetLABs. "You have to be able to compartmentalize polling and filtering."

NetLABs/Manager's support for grouping the network into domains is also a plus when managing larger networks, allowing individual groups to manage their own domains since no one manager can control the entire network (NetLABs, 415-961-9500).

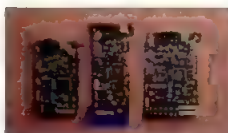
CABLETRON SPECTRUM

A leading manufacturer of intelligent hubs and networking components, Cabletron Systems offers both a high-end Unix-based platform called Spectrum and hub management applications for other vendors' platforms (collectively known as Spectrum for Open Systems.)



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How Macs Work

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How Software Works

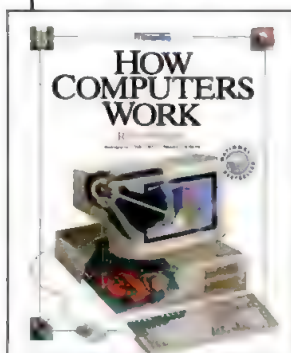
This dazzlingly illustrated volume from Ron White peeks inside the PC to show in full-color how software breathes life into the PC. Covers Windows™ and all major software categories.

How to Use Your Computer

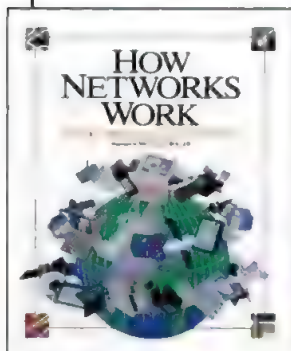
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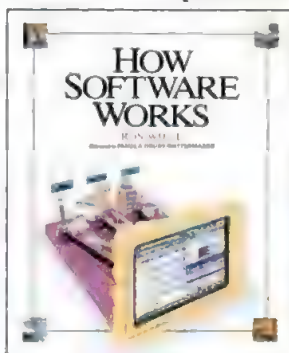
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How Networks Work

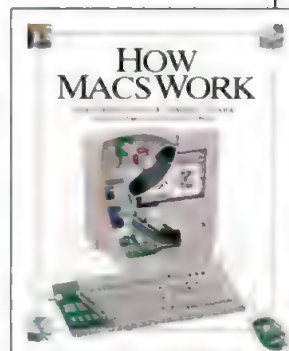
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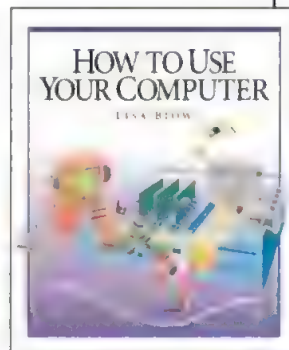
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TECHNOLOGY SPOTLIGHT

Spectrum is a client/server system that includes sophisticated network modeling technology for alarm filtering, alarm correlation, and fault isolation. It supports only a handful of third-party applications, but the software it does support is tightly integrated with the Spectrum modeling engine. The product provides multiconsole support with reduced traffic overhead by obtaining data from remote locations and displaying it locally.

"To really scale, you must move from merely X Window support to true client/server architecture," said Michael Skubisz, director of product development at Cabletron. "You want to have multiple management servers but see network utilization and (other aspects of network behavior) as one seamless picture."

Cabletron is positioning Spectrum as a high-end product capable of managing large enterprise networks with minimal staff. Cabletron Spectrum, for example, is the focal point of Duke University's network management strategy. In particular, Bob Currier, Spectrum user and director of network communications for Duke University (Durham, North Carolina) relies on Spectrum's Spectrophone voice-messaging application to notify him of impending trouble on the 4,000-node network when there's nobody in front of the Spectrum console. No matter where the staff is, they have instant communication with Spectrum (Cabletron Systems Inc., 603-332-9400).

A FINAL WORD

When it's all said and done, scalability manifests itself in how comfortably a product fits into a total network solution—gracefully growing as the network grows. Today's products address pieces of the problem, but a complete management package is still at the top of every network manager's wish list. "If I could ask Santa for one thing, I'd ask him for real-life applications that would solve my network problems end-to-end," quipped Martin Marietta's Belland. "That's what I want for Christmas."

Jill Huntington-Lee is an industry analyst and editor of the monthly newsletter, "Managing Distributed Systems," published by Faulkner Information Services, Pennsauken, New Jersey. 800-843-0460.

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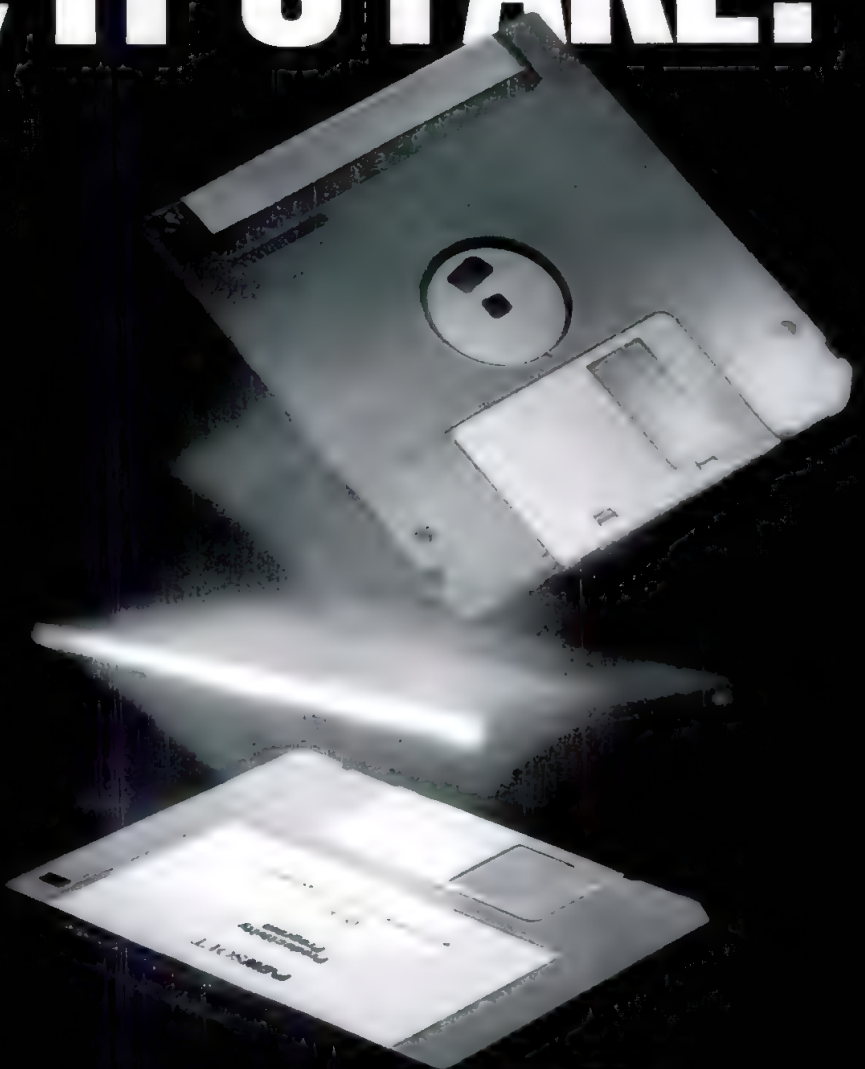
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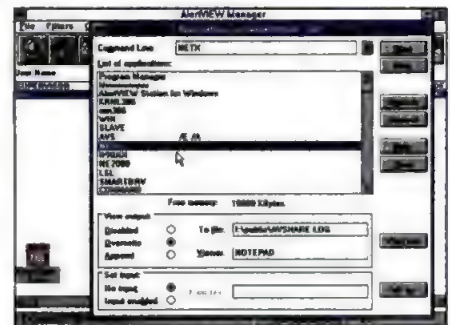
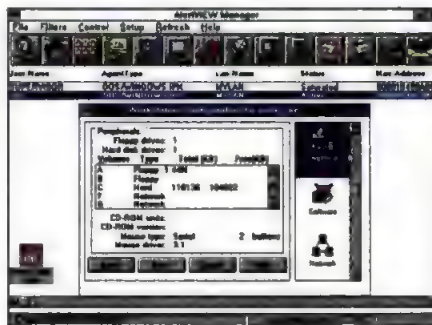
► NETWORK MANAGEMENT

AlertView Extends Network Management to The Desktop

BY ROBERT P. LIPSCHUTZ AND
JEFFREY D. BAHER

AlertView does for network administrators what television remote-control devices have done for couch potatoes everywhere. From an AlertView management station in the comfort of your office, you can monitor and control each of the client workstations on your network.

Specifically, AlertView allows you to monitor the applications that a specific workstation is running and discern which errors or events the applications are reporting to the underlying desktop and



EVERYTHING YOU NEED TO KNOW: AlertView's desktop management features provide an abundance of both hardware (left) and software (right) inventory information.

network operating systems, while also allowing you to take corrective action in certain cases. AlertView works with DOS clients and OS/2 clients and servers in NetWare, Microsoft LAN Manager, and LAN Server networks.

The loosely defined term *network management* is a marketing buzzword these days. There are many flavors of network management, and saying that a product provides network management gives little information about the true functionality of the product. AlertView, for example, is not truly network management software at all, but rather desktop management software that runs over a network. AlertView will tell you how applications are behaving on the client, and this knowledge is crucial to maintaining the health of your network.

AlertView's two strongest features are an application usage screen, which displays all currently open applications on each client workstation, and an Event Monitor, which provides real-time reporting on client application activity. Additional AlertView features include hardware and software inventory of workstations and some remote-client control capabilities such as reboot, freeze, and remote application starts. AlertView provides valuable information, though we were disappointed by the lack of reporting and printing tools.

Continues on page NE33

► ETHERNET SWITCHES

Switch Pioneer Kalpana Now Offers Bidirectional Ethernet

BY JEFFREY D. BAHER

Kalpana breaks new ground in the fast-paced Ethernet switch market as the first to implement full-duplex bidirectional Ethernet switch technology, designed to increase interswitch throughput. Available for the 5-port EPS-500 and 15-slot, chassis-based EPS-1500 Ethernet switches, Kalpana's Full Duplex Ethernet Switch (FDES) is based on a point-to-point connection between two switches that provides two full 10-megabit-per-sec-

ond (Mbps) communications channels: one for transmits and one for receives.

By definition, Ethernet is a half-duplex technology, meaning that Ethernet nodes cannot simultaneously transmit and receive. When one station needs to transmit, all other stations must listen or a collision will occur. This can be particularly limiting, especially when there are multiple clients contending for network bandwidth.

Kalpana was the first vendor to cir-
Continues on page NE34

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AlertView

CONTINUED FROM NE31

At startup, clients load a 22K AlertView TSR agent initiated from either their AUTOEXEC.BAT or network system login script. This agent initially sends workstation inventory information such as CPU type and RAM size to the Windows-based AlertView management station (AV Manager). The agent also informs AV Manager which applications reside in the client's RAM. An additional Windows application is loaded to monitor Windows' application usage. This information is viewed in AV Manager's Application Usage screen and is updated every time you open or refresh that screen, giving a snapshot of the applications loaded on the client station.

AlertView monitors application activity through its Event Monitor (AV Event Monitor). The client agent tracks ordinary events such as application launches and closings, as well as error events such as Windows application failures and network printing errors, then reports them back to the AV Event Monitor on the management station. In addition, AlertView provides the ability to filter out unwanted events at the client, since many network clients and their AlertView agents can generate a lot of network traffic.

Shany claims the application is the "Application Guru," but in reality, AlertView only manages the interface between applications and the operating system or network. This introduces certain limitations. For example, AlertView will not report when someone has made an error in a formula in a spreadsheet program as this error is within the application.

However, AlertView will tell you when a user has attempted to print to an undefined LPT3 port from within an application because this operation involves an interaction between the application and the underlying operating system. The Event List can report on 65

DOS and network events (typical events include "Attempt to Start Application", "Sharing Violation", and "Already Attached to Server").

The events reported by AlertView can be very helpful in managing applications, but we feel that the lack of reporting and printing facilities limits the AV Event Monitor's usefulness.

AlertView provides flexibility in dis-

can not really offer much help. For example, if AlertView encounters an abnormal application termination, the best it can do is restart the application. Besides event-invoked procedures, AlertView provides the ability to freeze, reboot, and even remotely control a client workstation, but these seemingly last minute add-ons need work as graphics problems (such as incomplete screen redraws) result from all three. Additionally, only Super VGA equipped workstations can be remotely controlled.

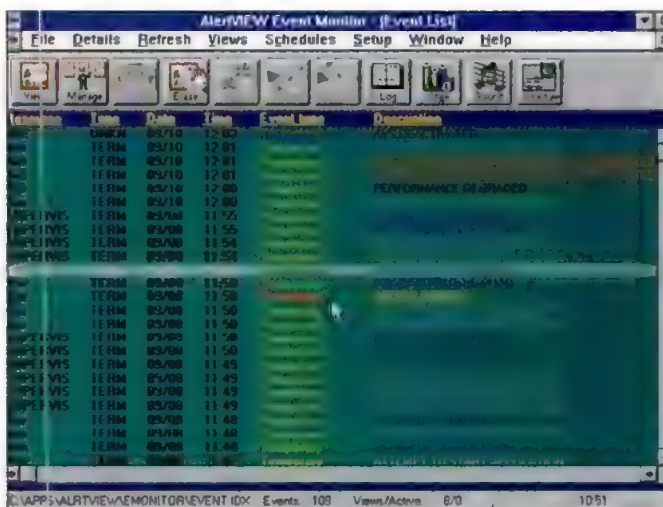
With Shany's addition of NMS support, Novell NetWare Management System (NMS) users can combine AlertView's Event Monitor with the NMS Alarm monitor, which provides integrated error reporting. AlertView can also send alerts to IBM's host-based NetView management product.

A common axiom says that people will do first that which comes easily to them. Shany gives network administrators the easy route to desktop application management. Shany is the

only company today that provides client application management, a very important area in monitoring a network. AlertView is worthwhile today, albeit a bit expensive at roughly \$100 per user, but could be improved in two areas: reporting features and application integration. Shany can improve the reporting features on its own, but application integration is more difficult. Application vendors such as Microsoft and Borland must provide hooks into their applications that Shany and others can use. The Desktop Management Task Force is working on the Desktop Management Interface (DMI), which would create standards for desktop management including application management. These standards will help Shany integrate with popular desktop applications, and therefore provide even more powerful control on the desktop.

• List price: *Shany AlertView, Version 2.1, 10-user license, \$995. Shany Inc., 1101 San Antonio Rd., #101, Mountain View, CA 94043; 415-694-7410; fax, 415-694-4728.*

Circle 965 on reader service card



THE STATE OF THE LAN: AlertView's Event Monitor allows you to track the status of applications running on network workstations.

playing the Event List through multiple views. For example, AlertView lets you create views that show only user-defined events such as bad program terminations or events related to specific applications. When adding a new application to your network, you can have AlertView report all events (program starts, stops, and errors) relating to that application. Unfortunately, there is no way to view specific user groups, to show, for example, how the accounting department is using your new application.

Overall though, AlertView provides good flexibility. The ability to assign different colors and sounds to events accents a pleasing user interface.

AlertView's ability to monitor applications is noteworthy and unique, but its ability to take corrective action is suspect. AlertView provides the ability to write procedures that are invoked upon receipt of specified events, but we found limited value for this functionality. AlertView is limited to treating the problems from outside the application itself, and therefore

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Kalpana

CONTINUED FROM NE31

cumvent this limitation with Ethernet switching. Operating much like a telephone switch, the Ethernet switch integrates a circuit-switching technology that allows for parallel Ethernet conversations to occur.

FDES is an enhancement to Kalpana's Ethernet switching technology that permits full duplexing: Two switches can simultaneously transmit and receive over the same physical medium, increasing total throughput.

FDES is based on a wiring scheme whereby the transmit circuit on each end of the connection is wired to the receive circuit at the other end. With only two stations on the medium and a cross-over cable pro-

viding the connection, the wiring scheme eliminates collisions, enabling a theoretical maximum total throughput of 20 Mbps. Keep in mind, however, that the maximum throughput remains 10 Mbps in each direction.

Results of ZD Labs' NetBench 2.06 NIC Throughput tests indicate an increase

in performance with FDES, but we found that the success depended largely on the network topology and network traffic patterns. When we tested the switches without background traffic, full duplexing proved no better than half-duplexing. However, FDES provided significant performance

gains when we tested the switches with a balanced, or symmetrical, traffic load. FDES demonstrated a 32 to 56 percent performance advantage (depending on the block size) versus half-duplex Ethernet.

We found that the success of Kalpana's FDES depends largely upon network topology and traffic patterns.

Benchmark Tests: Full-Duplex Ethernet Switch

We tested a Kalpana EtherSwitch EPS-500 both with and without background traffic and both with and without Kalpana's full-duplex Ethernet switch (FDES) technology in order to analyze the difference between half-duplex and full-duplex (bidirectional) Ethernet

Without background traffic, the FDES-equipped Kalpana EPS-500 performed no better than the half-duplex model. With background traffic, on the other hand, the full-duplex switch consistently outperformed its half-duplex counterpart

We used the **NIC Throughput** test from NetBench 2.06 to evaluate full-duplex and half-duplex Ethernet performance both with and without background traffic. One NetWare 3.11 server and three workstations were attached to each of the two Kalpana EPS-500 switches. To test performance without background traffic, we ran the test with the three workstations attached to one switch and the server attached to the other switch. The two switches were connected first in full-duplex mode and then in half-duplex mode. To create background traffic, we ran the **NIC Throughput** test in two directions simultaneously. The workstations attached to one switch accessed the server on the other switch, while the reverse took place in the background. We report the results for the foreground task

NIC THROUGHPUT (NO BACKGROUND TRAFFIC)

Megabits per second

Block size ►	64 bytes	512 bytes	1K	4K
Kalpana EtherSwitch EPS-500	0.82	4.89	6.10	6.01
Kalpana EtherSwitch EPS-500 with FDES	0.88	4.63	6.00	6.03

NIC THROUGHPUT (BACKGROUND TRAFFIC)

Megabits per second

Block size ►	64 bytes	512 bytes	1K	4K
Kalpana EtherSwitch EPS-500	0.56	2.86	4.04	4.04
Kalpana EtherSwitch EPS-500 with FDES	0.74	4.33	6.31	6.29

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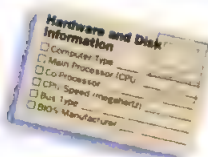
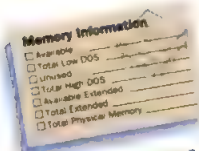
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Kalpana

CONTINUED FROM NE34

Kalpana's implementation of full-duplex technology succeeds in delivering greater Ethernet throughput, but its current implementation is limited strictly to communication between two Kalpana switches. This is likely to change, however, as other vendors introduce products that support full-duplex Ethernet. IBM, for example, recently announced the LANStreamer MC 32 Adapter, a 32-bit Micro Channel architecture adapter that will support both half-duplex and full-duplex operation. The LANStreamer should help extend full-duplex technology beyond Kalpana's domain, providing bidirectional Ethernet from server to switch or workstation to switch rather than just switch to switch.

Current Kalpana users can upgrade to FDES inexpensively: An EPS-500 upgrade is \$200, and an EPS-1500



MAKING A GOOD THING BETTER: With FDES, Kalpana's switches can now provide a total throughput of 20 megabits per second.

upgrade is \$100. Especially for those who already own Kalpana switches, FDES is an inexpensive way to gain a little more network throughput. For those who have not yet invested in Ethernet switches, FDES should not be a determining factor for purchase.

FDES gives only a marginal increase

in performance and is by no means the ideal solution for high-speed networking. The real decision should center on either investing in Ethernet switches or moving to a 100-Mbps technology such as Fiber Distributed Data Interface (FDDI), FDDI over UTP, Fast Ethernet, or 100BaseVG. If you decide to go with Kalpana's Ethernet switching solution, consider FDES a small additional bonus, especially until more vendors provide support for it.

• List price: Kalpana EPS-500, \$3,500 (with SNMP support, \$4,000; FDES upgrade, \$200); Kalpana EPS-1500, \$2,000 (with SNMP, \$3,500; FDES upgrade, \$100); half-duplex card, \$875; full-duplex card, \$975. Kalpana Inc., 1154 Arques Ave., Sunnyvale, CA 94086-4602; 408-749-1900; fax, 408-749-1690.

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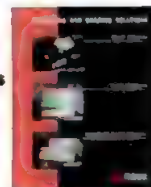
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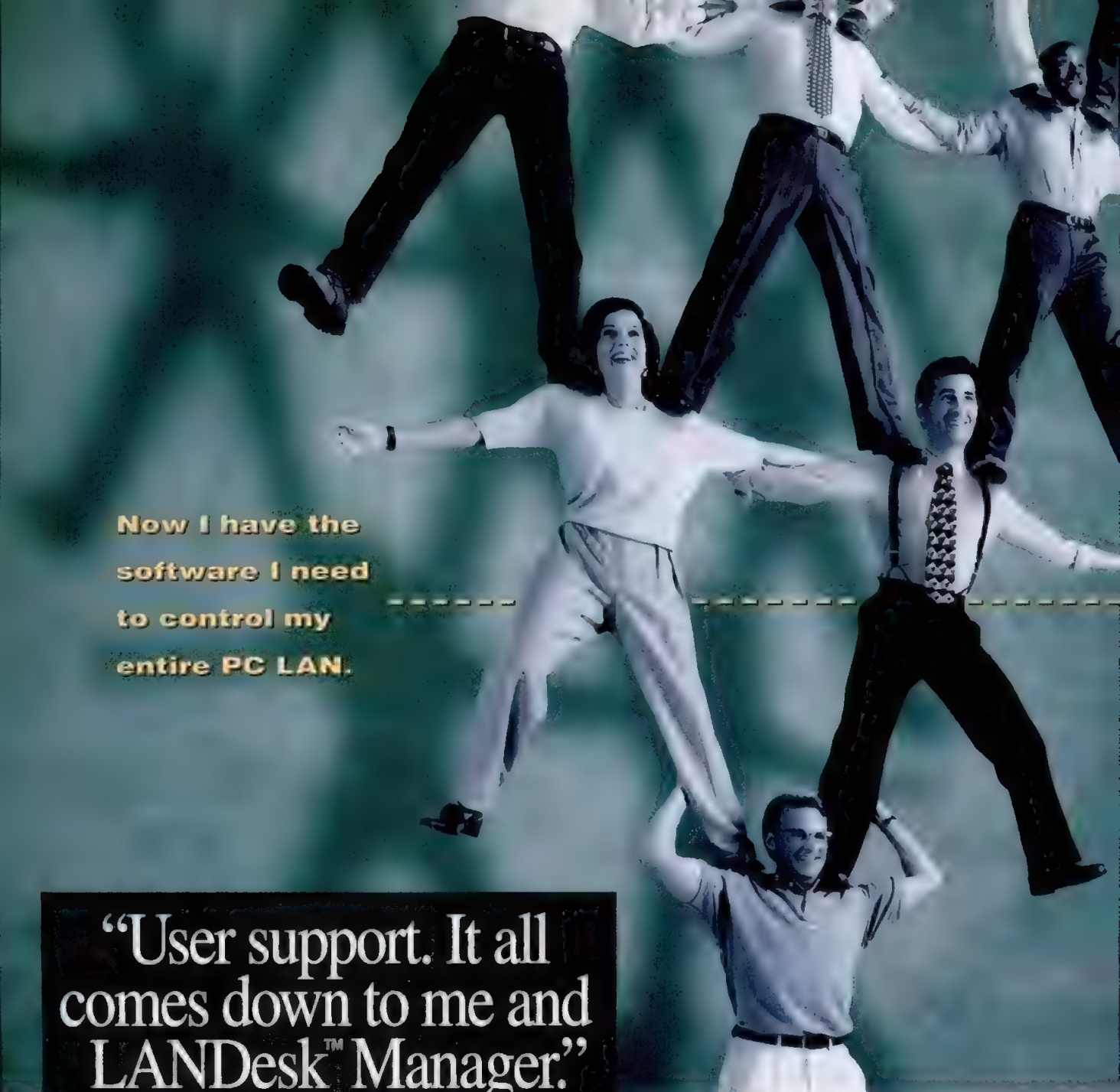
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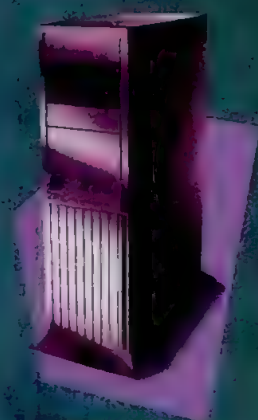
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► SCSI CONTROLLERS

Microtest Eases Network CD Access

BY JAMES KARNEY

The trend toward delivering software and information on CD-ROM is clear: If a program would otherwise ship on three or more diskettes, manufacturers deliver it on CD-ROM. A CD-ROM drive is no longer an optional luxury, it's a necessity. But every PC doesn't need a CD-ROM drive and sharing these drives across a network makes economic sense. Peer-to-peer LANs like LANtastic and Windows for Workgroups make it relatively easy to share CD-ROM drives mounted on individual PCs, but hardware conflicts in the server, the need for special NetWare drivers, and the location of the single server make it trickier to share CD-ROM drives under NetWare. Microtest Corp. addresses this problem with DiscPort, a unique product that makes it easy to share a CD-ROM drive across a NetWare network.

The Discport is a small box, about the size of a VHS tape, that features a 25-pin small computer system interface (SCSI) connection on one end and both thin Ethernet and 10Base-T connections on the other. A SCSI host adapter is normally placed inside the computer, forming a secondary bus for connecting peripherals, such as hard disks, scanners, and CD-ROM drives (for an in-depth discussion of SCSI, see "Fast and Flexible: SCSI Technology Grows Up," *PC Magazine*, June 29, 1993).

At present, the Discport provides connectivity for single-platter CD-ROM readers, but not jukeboxes or other SCSI devices. Microtest plans to enhance the Discport line by offering support for the Pioneer DRM-604X CD-ROM changer, Macintosh computers, and Token-Ring networks. Power for the Discport is supplied by a DC converter, which is provided along with a SCSI cable, documentation, and software for both Microsoft Windows and NetWare 3.11.

Installation requires simply attaching the drives and Ethernet to the Discport, then running a setup routine that copies the Discport NetWare Loadable Module (NLM) and Windows applications to the server. Anyone with rights to the directory can map a drive, mount a volume, and maintain the unit. An administrator can limit access or link access to certain groups



CD FLEXIBILITY: The video tape-size Discport allows you to connect a CD-ROM drive anywhere on your network.

as well as obtain statistics on usage using the DiscView software under Windows.

We tested Discport on a NetWare 3.11 server with a 2GB CorelRAID and an existing CD-ROM and Panasonic optical drive mounted using Corel's CSI Pro and their CDTools software. The DiscView software was installed on a workstation running Windows for Workgroups with a Toshiba 3301 CD-ROM using the Microsoft MSCDEX and a Corel SCSI Pro device module. We followed the automated steps as described in the manual, and the basic installation and software setup went smoothly.

We ran into difficulty after the NLM was loaded on the server and the Discport had been set up as a logical device under Windows. The Discport supports most of the features called for in the SCSI-2 standard, but not active termination. In our first setup we had an improperly terminated drive and had to rearrange the drives in the SCSI daisy-chain. Microtest says it is working on a solution to this problem, and that future revisions may support termination of power. It would have been nice to have had an on/off power switch on the unit while we were working. Each time we needed to rest the Discport, we had to unplug the power cable.

Once the drives and port were operating, we had no further complaints. There was no need to load any drivers on the workstation. We just ran the NLM on the server and mapped the drive using DiscView. The software is well-designed and very intuitive.

On a network, the feature set can be called outstanding. The drag-and-drop interface made it easy to mount and manage volumes from the workstation. Even an inexperienced user was able to eject and load disks after 5 minutes of instruction. You can enter information and notes about a disk, which the program will record. It is also possible to browse the database, even when there is no disk mounted in the drive. The only improvement would be the ability to permanently map a drive setting to a particular workstation. There was no conflict with any of the other SCSI or optical devices either locally or over the network.

The Discport is an excellent tool for anyone who needs to manage CD-ROM devices in a NetWare and Windows environment. It offers not only easy installation and management, but the ability to locate a drive anywhere along the Ethernet line.

• List price: Discport, \$695. Microtest Inc., 4747 North 22nd, Phoenix, AZ 85016; 602-952-6400; fax, 602-952-6401.

Circle 964 on reader service card



We invite you to discuss Network Edition articles and story ideas with PC Magazine editors David Greenfield and Frank Derfler in the Network Edition section of PC Magazine's Editorial Forum. Type GO ZNT:EDITOR from any ZiffNet or CompuServe prompt.

► NETWORK SECURITY

Trend Micro Devices Provides Hardware-Based Security Solution

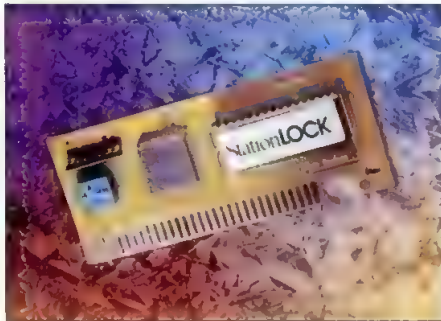
BY JAMES KARNEY

If you are looking for a hardware solution that provides PC password security, hardware access control, and virus protection, Trend Micro Devices may have what you need. The StationLock provides all of the above features in firmware on a very small 8-bit expansion card.

The card only contains four components: two chips, a resistor, and a four-position DIP switch to set the memory address. There isn't even an end bracket.

The StationLock's ROM takes over for the one on your motherboard during the boot cycle, then becomes an internal security guard. You can set passwords to limit access and determine which components an individual can use. The product's audit trail function can be used to track who uses a PC and when, and also to lock out a user during periods of the day. It will report any attempts to improperly log on to the system or use restricted functions.

Virus protection is an automatic function of the StationLock, which scans for active and latent viruses during installation and records signatures of the PC's boot files and the partition sectors for ready reference. If any improper changes are noted in the future, the StationLock will notify you and offer to take corrective action. You can also enable a file check mode that will scan either all files on a disk or just executables. Since the card has the actual boot files in ROM, a virus cannot reach those copies. The card can be updated with new signatures if the DOS version is changed, and a supplemental virus pattern file can be loaded on the hard disk to extend the StationLock's search capabilities. A TSR



SMALL BUT EFFECTIVE: Station Lock provides security with a minimum of hardware overload.

program, provided with the card, is used to scan disk activity during regular PC operations.

We installed the StationLock on a workstation with a Fast SCSI-2 hard disk, an UltraStor U34F host adapter, and a Matrox MGA graphics card.

Installing the card required some fine-tuning of the memory address and our extended memory manager. The StationLock can be addressed between C800 and DFFF, but it must be located above the BIOS of a SCSI or ESDI adapter.

We entered the StationLock's firmware setup by pressing the Del key during boot, and recorded the card's ID number, which is required to get support if the master password is lost or the card fails. The

next step was the creation of a rescue disk. This can be used to boot the system if you lose the password or to bypass the card.

Once the card was up and running, selecting options using the setup program was easy. We set a master user and password, which are used to set controls, limit access, and get audit information. Each user is given a unique password. A set of menus provides an easy method for setting up privileges and access rights. Only master users can use the setup program, and you can set a default user configuration to reduce the steps associated with adding new accounts. One possible trap door for the unwary master user is the automatic boot sequence. If there is no activity for a period of 20 seconds after power-up, the StationLock will boot the machine with its default settings.

We found the StationLock quite effective in managing access, but a bit more complex than most users would need in a standalone situation or for simple virus protection. If you run a network or have to maintain a PC (or its data) in a secure environment, the StationLock may be your solution.

• List price: *StationLock*, \$129. Trend Micro Devices Inc., 2421 West 205th St., #D-100, Torrance, CA 90501; 310-782-8190, fax, 310-328-5892.

Circle 967 on reader service card

Driver Alert

The following table lists recently released software drivers and utilities from Intel, Novell, and Thomas-Conrad. This software can be obtained from Library 9 (SOS Driver Alert) of the Utilities/Tips Forum on ZiffNet.

A complete source of network technical support information, including technical articles, documentation, and supplemental software from leading manufacturers and software publishers, can be found in Support On Site, the monthly CD-ROM published by Computer Library. For more information, call 212-503-4400.

Vendor	Filename	Size (kilobytes)	Release date	Description
Intel Corp.	README.1ST	5	1-Sep-93	README file for system software update for Intel's Storage Express (Version 1.11 A.E of Central Console Software)—1 of 4
Intel Corp.	SED1.EXE	572	1-Sep-93	System software update for Intel's Storage Express (Version 1.11 A.E of Central Console Software)—2 of 4.
Intel Corp.	SED2.EXE	1,057	1-Sep-93	System software update for Intel's Storage Express (Version 1.11 A.E of Central Console Software)—3 of 4.
Intel Corp.	SED3.EXE	549	1-Sep-93	System software update for Intel's Storage Express (Version 1.11 A.E of Central Console Software)—4 of 4.
Novell Inc.	L11U04.EXE	27	3-Sep-93	Update for NetWare Lite 1.1.
Novell Inc.	L11P05.EXE	21	3-Sep-93	Patch file for NetWare Lite 1.1.
Novell Inc.	SECLOG.EXE	182	2-Sep-93	Security enhancement LOGIN.EXE 4.02.
Novell Inc.	OS2UTL.EXE	457	26-Aug-93	OS/2 utilities.
Thomas-Conrad Corp.	TOK31X.EXE	74	28-Aug-93	NetWare 3.1x Token-Ring server drivers, Version 1.51.

APPLICATION SERVER

Xinetron Introduces Affordable Solution for Remote Access to Server

BY STEVE RIGNEY

We started using networks because we needed to share printers and hard disks. Now, we can also share processing and display power—even over modem connections. Xinetron's WinAccess Server is an affordable and practical system for sharing the processing of Microsoft Windows applications. It allows 80286 client PCs and remote workstations to run Windows 3.1, OS/2 2.x, and DOS applications.

The hardware/software bundle comprises a 486 DX2/66 PC with a four-port Digiboard I/O card and connector, Citrix Systems' WINview for Networks application server software, and four 14.4-kilobit-per-second (Kbps) fax modems.

The WinAccess Server is ideal for organizations that need to use 386-based protected-mode applications but do not want to (or cannot afford to) update its 286s. The WinAccess Server supports both direct network connections and remote modem connections.

WINview is 32-bit application server software that runs over a reengineered version of OS/2. It includes a network version of the NetWare OS/2 requester that allows you to run multiple remote connections on one adapter. Citrix has also replaced the OS/2 graphical Presentation Manager with a character-based Task Swap program that requires much less time for screen redraws.

Generally, running Windows applications over a phone line isn't practical

because of the slow speed of screen refreshes and mouse movements. Remote-control communications, therefore, are normally reserved for DOS applications. But the WinAccess Server offers roughly the same performance

application runs on the WinAccess Server, and the split workload reduces the amount of traffic between client and server and improves performance.

WinLink establishes a modem connection to the WinAccess Server from which you can remotely launch Windows, DOS, or character-based OS/2 applications. You can also access a DOS or OS/2 window from within your remote Windows session. LANlink offers the same functionality but connects to the WinAccess Server via network cabling. LANlink supports Novell's IPX as well as NetBIOS/NetBEUI, the network communications protocols used in many network operating systems.

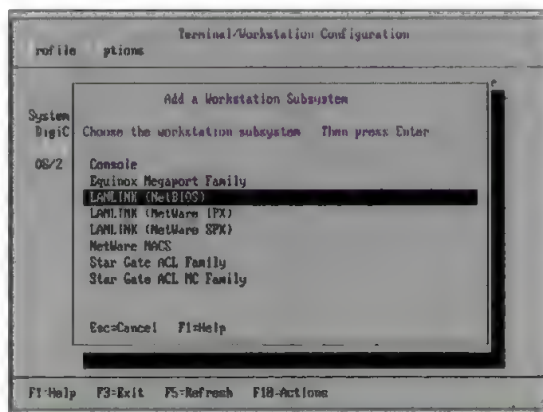
While the WinAccess Server does not make any changes to WINview, it offers a valuable solution by bundling and configuring everything for you. WINview has two major drawbacks: complexity and size. While it is a robust application with strong security features, it is hampered by nonintuitive, cumbersome client-setup procedures. And because it runs over OS/2 and offers support for Windows, OS/2, and DOS, it is a large program—it ships on 24 disks and with more manuals than NetWare 3.11. Finally, administrators can run into hardware support problems, since OS/2 is a bit picky about the hardware it supports.

Xinetron lets you bypass WINview's problems because it ships the WinAccess Server with WINview installed and the Digiboard and modems preconfigured. Installation was extremely simple.

The WinAccess Server offers an affordable way to provide remote access to an application server. It provides 286s and slow 386s with the ability to run DOS, Windows, and OS/2 applications and can save the cost of expensive across-the-board upgrades.

• List price: WinAccess Server: 4-port, \$7,995; 8-port, \$11,670. Xinetron Inc., 2302 Walsh Ave., Santa Clara, CA 95051; 800-345-4415; 408-727-6499.

Circle 968 on reader service card



MULTIPLE CHOICE: You can connect to the WinAccess Server by modem or network connection (top). WinLink tracks statistics of your modem connection (bottom) while LANlink does the same for your network connection.

you would expect from running Windows locally. The WinAccess client software—WinLink and LANLink—allows the client PC to run Windows graphics display and user interface processes, such as mouse drivers, locally. The Windows

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FTP Software, Inc., Director of Development

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THE PEOPLE BEHIND TCP/IP FOR THE PC.

► NETWORK SECURITY

F-Prot Professional Provides Powerful Virus Protection

BY JAMES KARNEY

The basic requirements for a network antivirus utility are simple but vital: It has to be accurate, reliable, and easy to use. F-Prot Professional from Command Software Systems is a complete antivirus package that addresses all of these requirements. F-Prot Professional offers both workstation and server protection with all the control that an administrator needs and also the simplicity to keep it out of the network users' way.

F-Prot is really two applications in one:

The first is a DOS-based virus prevention, detection, and removal product that can be used either as a TSR or interactive program, and the other is a NetWare 3.x NLM that provides similar functions on a server. The \$995 bundle includes the software, manuals, and a 25-user license.

F-Prot is a suite of DOS programs that can be driven either by a menu or a command line interface. The package can identify and repair over 2,000 known viruses and can apply a heuristic model to locate previously unknown forms. If F-Prot is kept resident as a TSR, it will prevent infected applications from loading.

A handy on-line reference provides detailed information about the history, type, action, and repair prognosis of the known viruses.

Network functionality is provided by the Net-Prot NLM, which performs virus scans on the server and can be set to include reads, writes, copies, and executes. A menu allows the supervisor to specify the action to be taken against a detected virus, set a schedule for automatic scans, exclude files from a scan, and define what kind of notice should be broadcast and who should receive it. The Net-Prot NLM can be set to scan when loaded, as well as operate in a real-time mode.

The DOS program on a workstation can be used to check both local and network drives in Secure, Quick Scan, or Heuristic modes. The Secure scan uses two signatures, reports any strain found, then repairs any damaged files. It also looks for Trojan horses, which do their damage as soon as they infect the system rather than waiting for a specific event to

We came. We s

Of course, we're not normally ones to boast, but in this case, it's too hard to resist. Recently, *Communications Week* tested several internetworking devices in multi-protocol environments.

3Com's NETBuilder II® earned a perfect score in every single test scenario. The first perfect overall score recorded.

Anything they could dish out, this router could take.

Surprised? We weren't. After all, NETBuilder II was designed to be the most powerful, flexible router made.

So powerful, its advanced RISC processor and high-speed bus make it one of the industry's top performers. At a price that's almost a third less than our biggest competitor.

And so flexible, it can support Novell's IPX, AppleTalk,

First Perfect Overall

Cisco device takes a licking, but 3Com bridge-router keeps on ticking

By EDWIN E. NIER
AND CHRIS GRILIANO

When bridge-routers from Cisco Systems Inc. and 3Com Corp. were evaluated for this installment of *Communications Week's* mixed-LAN test program, it was 3Com's NetBuilder II that carried home the awards.

In fact, the NetBuilder II is the only bridge-router among the six tested to date in our series to command a perfect score for all test scenarios.



The NetBuilder II impressively handled the worst traffic we tested with, outskipping that performance of led with a price tag that is considerably lower than many other

er market leaders'. 3Com's bridge-router is a great choice for users needing token-ring and Ethernet LANs.

In performance, Cisco's MG bridge-router clearly lags behind the 3Com device. The MGs—a product that is older than the 7000 series bridge—was still marketed by Cisco at a user site in our labs, despite the vendor's decision not to participate in our test program.

The Cisco device is the most expensive at \$1,500. The NetBuilder II, at \$1,000, is a great value for the performance it offers. The IPX and AppleTalk support is a plus, as is the fact that the NetBuilder II is a true multi-protocol router. The price tag is also considerably lower than many other



KEEPING THE NETWORK HEALTHY: The Net-Prot NLM features a simple menu system for launching and monitoring network virus scans.

trigger them. A Quick Scan uses only one signature during its search and identifies only the family to which the virus belongs, not the actual strain. The Heuristic method reports suspicious code based on a set of rules rather than

matching signatures. On our test system, a full scan of more than 2,000 files on the server was accomplished during light traffic with no noticeable degradation of performance. The real-time memory-resident monitor mode only used 1,124 bytes.

matching signatures.

We set up F-Prot on a small network with a Novell NetWare 3.11 server and four workstations. The file server was equipped with a 2GB Level 5 Core RAID containing three 1GB drives. The workstations were all running Windows for Workgroups on MS-DOS 5.0 and using either 386MAX 7.0 or QEMM 7.0 for local memory manage-

We scanned each workstation, including one deliberately infected with a copy of the Form virus. Form hides in the DOS boot sector but does not seem to do any actual damage to the system. Using both Secure and Quick Scans, F-Prot located the infection without difficulty and removed the virus from our system.

Overall, F-Prot is a well-designed antivirus suite that is capable of meeting the needs of both DOS and NetWare users. With its easy-to-operate menus, even a novice can be assured of a clean, virus-free system. F-Prot's Flexible command modes allow network administrators and power users alike to set up complete network virus protection with a minimum amount of fuss and memory overhead.

• List price: *F-Prot Professional*, \$995 for a 25-user version. Command Software Systems, 1061 Indiantown Rd., #500, Jupiter, FL 33477; 407-575-3200, fax, 407-575-3026.

Circle 966 on reader service card

aw. We routed.

Score Earned

PERFORMANCE IN A MIXED LAN ENVIRONMENT

From an Ethernet and a token-ring LAN were sent to a 3Com NetBuilder II for network management. Under worst conditions, packet sizes and the number of nodes were varied to test the network's ability to handle a mixed environment. The results show that the network can handle a mixed environment with no loss of data.

Protocol tested and results:

AppleTalk

No. of nodes	Packet size in bytes				
100%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%

DECnet

No. of nodes	Packet size in bytes				
100%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%

IBM NetBIOS/NetBEUI, Banyan VINES, DECnet, XNS, OSI, and TCP/IP protocols. Not to mention any LAN or WAN media, including FDDI and other high-speed media that come along.

NETBuilder's modular design means interface, media, topology, and technology changes can be made in no time. Plus, hot-swappable modules make network problems easy to repair, with absolutely no interruption in service. In fact, meantime board replacement is less than five minutes. Want to know more about NETBuilder II? Give us a call at **1-800-NET-3Com.**

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NEWS OF ANNOUNCED NETWORK PRODUCTS AND UPGRADES

NEW

Proteon Readies Its New Router for ATM

Proteon's recent addition to its router family, the Corporate Network eXchange (CNX) 400, promises flexibility and scalability. The three-slot router offers network managers a choice of network combinations: three LANs, six WANs, and one Fiber Distributed Data Interface (FDDI). Designed for midrange environments, the CNX 400 features routing over FDDI, Token-Ring and Ethernet, as well as support for non-routing protocols such as SNA, NetBIOS and local area transport.

Proteon's newest router also features interchangeability with the company's CNX 500 and 600 routers. I/O interface cards can be swapped between the routers, eliminating the need to buy new cards and providing centralized management. The CNX 400 features

Bandwidth Reservation, a bandwidth allocation technology that provides throughput rates up to 25,000 packets per second. Proteon has designed the router with the intention of upgrading to asynchronous transfer mode (ATM) technology. The company will deliver its ATM interface card for integration into the CNX family in 1994.

•List price: *Proteon Corporate Network eXchang 400*, \$3,995 to \$11,195. *Proteon Inc.*, Nine Technology Dr., Westborough, MA 01581-1799; 508-898-2800; fax, 508-366-8901.

Circle 952 on reader service card



ALL IN THE FAMILY: The CNX 400 swaps cards with the CNX 500 and 600.

NEW

Cisco's Routers Provide ATM Protocol Support

Cisco Systems demonstrated its ability to work with a variety of asynchronous transfer mode (ATM) switch vendors at Interop, advancing the company's commitment to high-speed networking. Results of the interoperability tests, confirm the compatibility of the router and switches from Fore Systems, GTE, NEC, Newbridge Networks, and TRW, providing network managers with a choice for upgrading to ATM.

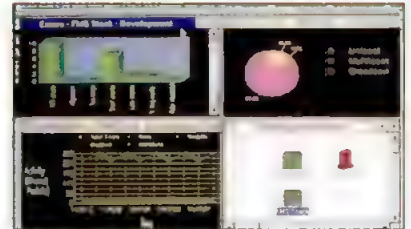
The tests used Cisco 7000 and AGS+ routers, Digital Link DL3200 Digital Service Interfaces, and ADC Kentrox DataSmart T3/E3 ATM Data Service Units (ATMDSUs) in combination with the five switches. Cisco's test results indicated that its routers could handle the transmission of data to any of the five switches.

Cisco also announced that it will support the ATM Data Exchange Interface (DXI), a proposed standard that describes how routers communicate with ATMDSUs. The standard will insure greater interoperability between the routers and the ATMDSUs. The standard will be incorporated in Cisco 7000 and AGS+ router software in mid-1994.

•List price: *ATM DXI will support Cisco 7000 and AGS+ software*. *Cisco Systems Inc.*, P.O. Box 3075, 1525 O'Brien Dr., Menlo Park, CA 94026; 800-326-1941, 415-326-1941; fax, 415-326-1989.

Circle 953 on reader service card

HOT PROSPECT



3Com Delivers Real Network Management

3Com Corp.'s new network management application does just what it says it will: it manages the network. Transcend, a family of network management software, provides network administrators with an integrated solution rather than device management. By logically grouping network devices, the software provides administrators with a topological view of the interconnected devices.

This is accomplished through the use of SmartAgent software. The SmartAgents use standard management information bases and remote monitoring to collect and analyze data from nonintelligent and non-3Com products. Transcend will be available in phases, beginning with Transcend NETBuilder Manager and Transcend LinkBuilder FMS Manager. Platform support will include SunConnect's SunNet Manager, HP's OpenView for Unix, IBM NetVIEW/6000, Microsoft Windows, and Novell NMS.

•List price: *Transcend NETBuilder Manager, Version 2.0*, \$3,000; *Transcend LinkBuilder FMS Manager for Microsoft Windows*, \$495. *3Com Corp.*, 5400 Bayfront Plaza, P.O. Box 58145, Santa Clara, CA 95052-8145; 800-638-3266.

Circle 951 on reader service card

NEW

UB Eases into 100BaseVG Standard

Ungermann-Bass now provides a way to change from 10BaseT to 100BaseVG without incurring the expense of rewiring the network. 100BaseVG, an alternative to ATM, boosts the 10-megabit-per-second (Mbps) throughput of 10BaseT to 100 Mbps. UB participated in a multivendor interoperability demonstration of the standard at Interop in which UB's 12-port Ethernet concentrator featured an embedded 80960 RISC processor and a standard SNMP agent managed by UB's NetDirector network management platform. The concentrator can achieve speeds of up to 100 Mbps at of up to 100 meters.

•List price: *Migration path product and pricing to be announced. Ungermann-Bass Inc., World Headquarters, 3900 Freedom Circle, Santa Clara, CA 95052-8030; 800-777-4526, 408-496-0111; fax, 408-970-7386.*

Circle 954 on reader service card

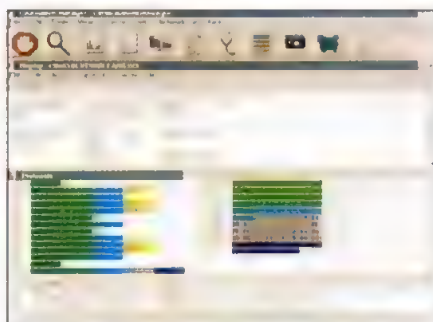
NEW

ProTools Offers Choice of Platforms for Network Analysis

ProTools now provides network managers with the ability to implement its network analysis products on multiple operating systems using the management platform of their choice. The Network Analysis Series offers monitoring and analysis of DOS, Microsoft Windows 3.1, Windows NT, OS/2, and Unix environments. The line consists of a Foundation Manager, Cornerstone Agent, and ProbePlus. Combined, these features provide capabilities such as threshold setting and alarming.

•List price: *Network Analysis Series: Foundation Manager for Microsoft Windows, Version 3.1; Microsoft Windows NT; and OS/2, Version 1.3 or 2.x, \$10,795. Cornerstone Agent for Microsoft Windows, Version 3.1; Microsoft Windows/NT; OS/2, Version 1.3 or 2.x, \$1,550. Foundation Manager and Cornerstone Agent for Unix, pricing not yet determined. ProbePlus comes bundled with the package. ProTools Inc., 14976 NW Greenbrier Pkwy., Beaverton, OR 97006-5733; 800-743-4335, 503-645-5400; fax, 503-645-3577.*

Circle 955 on reader service card



TOTAL CONTROL: The Network Analysis Series monitors and analyzes the network.

NEW

Grand Junction Leads the Way for Fast Ethernet

Grand Junction Networks now provides network managers with the ability to add bandwidth on demand based on their workgroups' needs. Its new line of adapters offers Fast Ethernet and 10-megabit-per-second (Mbps) Ethernet switching solutions.

FastSwitch 10/100 is the first workgroup switching hub to provide 100-Mbps Ethernet to servers and 10 Mbps to clients. The FastNIC 100 EISA is a Fast Ethernet (100-Mbps) adapter that provides connectivity to EISA servers. The FastSwitch 10 is a 10-Mbps Ethernet workgroup switching hub. FastSwitch 10 addresses peer-to-peer and multiserver workgroups whose nodes require equal bandwidth.

•List price: *Grand Junction FastSwitch 10, \$6,250; Grand Junction FastSwitch 10/100, \$7,250; Grand Junction FastNIC 100 EISA, \$399. Grand Junction Networks Inc., 3101 Whipple Rd., Union City, CA 94587; 800-747-3278, 510-487-5985; fax, 510-487-7652.*

Circle 956 on reader service card

BRIEFS

ROUTERS

Newport Systems Solutions'

LAN2LAN/MPR (Multi-Protocol Router), LAN2PC, and XCI Enhanced communication products now feature T1/E1 data compression support. The new software and high-speed data compression module (HDCM) provide increased line speeds up to T1/E1 (1.544 to 2.048 megabits per second) and an average of 4:1 data compression. 714-752-1511; fax, 714-8389.

Penril Datability Networks provides additional protocol support for its line of BRX bridge router products. The BRX bridges now include support for the DECnet Phases IV and V, AppleTalk, and OSI routing protocols in addition to previous support for TCP/IP, Novell SPX/IPX, and Xerox XNS. 301-921-8600; fax, 301-921-8376.

BRIDGES

Data Race's new remote Ethernet LAN bridge integrates voice, fax, data, and LAN traffic over one or more wide area networks. The MACHnet bridge (\$1,195) is a plug-in module for the MACH DS plus multiplexer line. Network managers can interconnect remote Ethernet LANs as well as combine multiple leased and dial-up lines over single or multiple wide area links. 210-558-1900; fax, 210-558-1929.

Gandalf Premier added two new products to its line of bridges, each addressing different segments of the market. The LANLine 5211 (\$895) is a high-speed local bridge for isolating workgroups or Ethernet segments from networks. The LANLine 5240 ISDN bridge (\$3,000) addresses the need of remote offices for bandwidth on demand over ISDN. 613-723-6500; fax, 613-226-1717.

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IMPROVED

U.S. Robotics Speeds Up Courier Modems

U.S. Robotics' latest improvements to its Courier modems promise increased speed. The most noteworthy enhancement is the implementation of the 19.2-kilobit-per-second (Kbps) V.32 terbo protocol. Developed by AT&T, it increases the connect speed from 14.4 Kbps to 19.2 Kbps. When the protocol is coupled with the company's proprietary Adaptive Speed Leveling (ASL) technology, two Courier modems can enjoy speeds up to 21.6 Kbps. Another feature added to several modems in the Courier line is the availability of HST cellular, a proprietary protocol for high-speed cellular data transmission.

•List price: *U.S. Robotics Courier V.32 terbo*, \$695; *U.S. Robotics Courier V.32 terbo/PC*, \$645; *U.S. Robotics Courier V.32 terbo FAX*, \$795; *U.S. Robotics Courier V.32 terbo FAX/PC*, \$745; *U.S. Robotics Courier V.32 terbo FAX/PS/2*, \$745; *U.S. Robotics Courier HST Dual Standard with V.32 terbo FAX*, \$1,295; *U.S. Robotics Courier HST Dual Standard with V.32 terbo/PC*, \$1,245. *U.S. Robotics Inc.*, 8100 N. McCormick Blvd., Skokie, IL 60076; 800-342-5877, 708-982-5010; fax, 708-982-5235.

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TERBO CHARGED: Use of the V.32 terbo protocol enhances modem speed to 19.2 Kbps.

IMPROVED

ODS Previews 100BaseVG Fast Ethernet

Optical Data Systems confirmed its commitment to high-speed networking at Interop, announcing integration of the 100BaseVG 100-megabit-per-second (Mbps) Fast Ethernet technology into its ODS Infinity intelligent switching hub. The 100BaseVG technology is Hewlett-Packard's method of increasing the speed of Ethernet from 10 Mbps to 100 Mbps. 100BaseVG runs over any grade of UTP wiring, including Category 3 and Category 5. It also provides network managers with another means of accommodating bandwidth-intensive applications such as multimedia. ODS will offer its solutions, a variety of 100BaseVG hub modules for the Infinity lines, in the first quarter of 1994.

•List price: *100BaseVG hub modules for Infinity switching hubs*. *Optical Data Systems Inc.*, 1101 E. Arapaho Rd., Richardson, TX 75081; 214-234-6400; fax, 214-234-1467.

Circle 958 on reader service card

NEW

Thomas-Conrad Strengthens Hold on Token-Ring Market

Thomas-Conrad Corp.'s latest entry into the Token-Ring adapter market offers enhanced performance and easier installation for an affordable price. The TC4047 Token-Ring EISA Adapter promises increased throughput low CPU utilization. In order to accomplish this, the TC4047 combines the capabilities of an on-board Intel 80186 processor, accelerated frame processing, 32-bit EISA bus-mastering technology, and 33-MHz burst mode support.

TC4047 also features a software-configurable design and automatic media detection for simplifying configuration, a Token-Ring diagnostic tool for easier installation, and bracket-mounted LEDs for troubleshooting.

•List price: *Thomas-Conrad TC4047 Token-Ring EISA Adapter*, \$995. *Thomas-Conrad Corp.*, 1908-R Kramer Ln., Austin, TX 78758; 800-332-8683, 512-836-1935; fax, 512-836-2840.

Circle 959 on reader service card

BRIEFS

ADAPTERS

Madge Networks introduced a new Token-Ring adapter, the Smart 16/4 ISA Client Ringnode. The adapter is designed for DOS and Windows workstations for single protocol environments. The adapter, priced at \$560, also features the Fastmac and Fastmac Plus software drivers for increased packet processing and data throughput. 800-876-2343.

Kingston Technology Corp. unveiled a new line of IBM-compatible Token-Ring products. The TokenRx line includes a Dual Interface Adapter Card (\$375) and two Multistation Access Units (MAUs) (\$435 to \$465). The adapter features a DB-9, shielded twisted-pair (STP) and an RJ-45 unshielded twisted-pair (UTP) interface. It also supports popular network operating systems, including IBM LAN Server, Novell NetWare, and Microsoft LAN Manager. The eight-port Multiple Access Units are available in either STP or UTP interfaces. 714-435-2600.

MODEMS

Practical Peripherals announced its intention to support the V.Fast Class standard for transmission speeds of up to 28.8 kilobits per second (Kbps). V.Fast promises increased speed, line probing, and enhanced modulation techniques. Products will begin shipping in the fourth quarter. 805-497-4774.

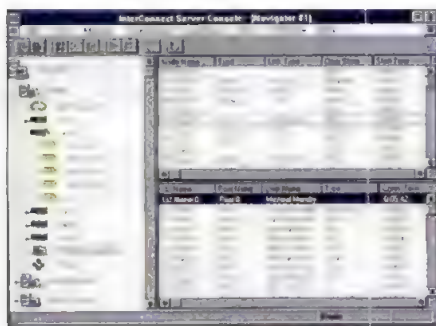
ZyXel offers network managers a choice of bundled voice/fax software packages free with the purchase of a high-speed modem. The packages, available in DOS, Windows, and Macintosh platforms, include integrated voice and fax line sharing, call forwarding, remote access, and private mailboxes. 714-693-0808.

NEW

Eicon Simplifies Network Integration

Eicon Technology is now shipping InterConnect Server (ICS) for NetWare, designed to simplify the integration of branch offices into enterprise networks. ICS for NetWare combines router, gateway, and network management technologies into one product. The product allows remote PCs and workstations to access corporate resources over an internetwork or Systems Network Architecture (SNA) network.

Routing protocols include Novell's IPX/SPX, TCP/IP, and AppleTalk. Support for



3 IN 1: the new server integrates router, gateway, and network management functions.

PPP, Frame Relay, and X.25 allows ICS for NetWare to work with routers from Cisco and Wellfleet. ICS for NetWare is also a multiprotocol gateway that offers support for SNA and non-SNA environments. Integrated SNMP-based network management tools complete the product's three-in-one functionality.

- List price: *Eicon InterConnect Server for NetWare*, \$3,495. *Eicon Technology Corp.*, 2196 32nd Ave. (Lachine), Montreal, Quebec, Canada H8T 3H7; 514-631-2592; fax, 514-631-3092.

Circle 960 on reader service card

NEW

SysKconnect Provides FDDI Over UTP

SysKconnect joins a number of other vendors that have recognized the need for providing the means to use fiber at an affordable cost. The company announced a variety of products that comply with the ANSI draft standard for running Fiber Distributed Data Interface (FDDI) over unshielded twisted-pair (UTP) and shielded twisted-pair (STP) copper wiring. The ANSI standard (known as TP-PMD) allows SysKconnect's SK-NET FDDI network interface cards and SK-FDDI workgroup concentrators to work over Category 5 copper cable at distances of up to 100 meters.

- List price: *SysKconnect SK-NET FDDI ISA, EISA, MCA, and NuBus Network Interface Cards*, \$995-\$2,700; *SysKconnect SK-FDDI Concentrators*, \$9,200-\$15,000. *SysKconnect Inc.*, 12930 Saratoga Ave., Suite D-1, Saratoga, CA 95070; 408-725-4650; fax, 408-725-4654.

Circle 961 on reader service card

NEW

Cascade Connects LANs and WANs with ATM

Cascade Communications Corp.'s recent announcement of the B-STDx 9000 provides network managers with a cost-effective solution for connecting LANs and WANs. The B-STDx 9000 is a standards-based broadband packet asynchronous transfer mode (ATM) switch that answers the need for increased bandwidth by providing an upgrade path from Frame Relay to ATM and Switched Multimegabit Data Services (SMDS).

Cascade's switch features two unique capabilities for improving the cost and performance of wide area networking: OPTimum (Open Packet Trunking) and QuickPath. OPTimum eliminates the need for expensive leased lines, allowing network managers to substitute them with more affordable public services such as Frame Relay, ATM, or SMDS. QuickPath allows network managers to customize network delays.

- List price: *Cascade B-STDx 9000*, \$30,000 (base unit); \$160,000 for a fully redundant T3 configuration. *Cascade Communications Corp.*, 239 Littleton Rd., Unit #4A, Westford, MA 01886; 800-342-5926, 508-692-2600; fax, 508-692-9214.

Circle 962 on reader service card

BRIEFS

NETWORK MANAGEMENT

Ungermann-Bass extended the capabilities of the Virtual Network Architecture (VNA) with the announcement of NetDirector/VNA for Unix (\$5,000), an application that runs under NetDirector for Unix, a management platform based on HP OpenView. The integration of VNA with NetDirector and OpenView provides network managers with workgroup management capabilities across multiple industry-standard platforms. Network managers now have a choice of platforms for designing management solutions for their networks. 800-777-4526.

Chipcom Corp. joined the ranks of HP OpenView supporters with its new version of its ONdemand Network Control System (NCS) software. ONdemand NCS, Version 2.0 (\$4,495), is a graphical application package that provides management for various Chipcom network devices including bridges, routers, and concentrators. The application now supports a wider variety of platforms, such as HP OpenView and Digital Equipment's PolyCenter line, in addition to previous support for IBM's NetView 6000 and SunConnect's SunNet Manager. Version 2.0 includes new diagnostic tools, station maps for Token-Ring and FDDI, and new graphing and pie charts for Token-Ring status. 508-460-8900; fax, 508-460-8950.

Fujitsu Open Systems Solutions

(FOSSI) announced the first U.S. release of its Unix-based SNMP (Simple Network Management Protocol) solution for Sun SPARC and Fujitsu DS/90 workstations. NetWalker, Version 1.2 (starting at \$6,500), provides control and monitoring for a combination of LAN and WAN products. 800-545-6774; fax, 408-456-7739.

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American Power 220 VOLT

BackUPS 250/400/600

BackUPS 300 1250

Matru 3000/5000 VA UPS

SmartUPS 250/400/500/500 279/429/659

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NETWORKING BREAKTHROUGH

Not Just Network Management, Integrated Network Management

David, it takes a fat wad of cash to create an integrated network management system, and the request for that cash goes through the corporate budget process like an elephant through the subway. Besides, there is no Tooth Fairy, and there is no totally integrated management product that comes packaged with a magic wand. I prefer to gather my own tools for the job.

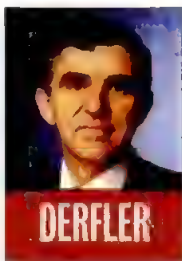
Most network problems are cable problems. If the cable is down, or even just below par, the fancy network management system, relying on the Unreliable Data Protocol (UDP) to carry its traffic, is out of luck. Yes, you can fall back to dialing into hubs and routers, but that capability costs a lot more up front, and it's slow. Sorry, Dave—I want a hammer, not a feather.

Broad-scale network management is already an organizational anachronism. Modern organizations no longer have a command-and-control architecture with a centralized staff to use those integrated reports and the charge-back data you covet.

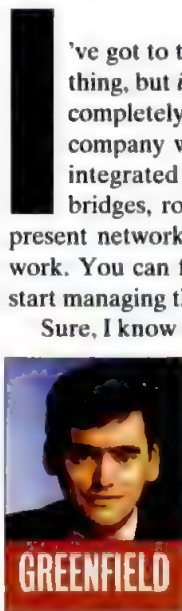
One size doesn't fit all. Instead of investing money and faith in a single integrated solution, today's savvy network manager should build a personal toolbox filled with a customized selection of the software and hardware that works best on that particular LAN in that particular workgroup.

Use a blend of comfortable tools. My toolbox includes an inexpensive Mod-Tap SLT3 to check cable continuity, Close-Up LAN to use network remote control, XTree Tools for Networks to report the status of the server and other chores, and Triticom's LANdecoder/e to see what an application is trying to do occasionally. If I'm working with SNMP-equipped devices, then I use the management and mapping in VisiSoft's VisiNet software.

David, with these kinds of tools, an empowered owner of the network process can make a real contribution to the value of the organization without burning a bushel of cash as a sacrifice to centralized management.



**There is no totally
integrated network
management product
that comes packaged
with a magic wand.**



**Integrated network
management means
fewer packages and
more effective use of
those packages.**

I've got to tell you, Frank—network management is one thing, but *integrated* network management is something completely different. It's not surprising that 3Com, the company with nine lives, is leading the charge. Under integrated network management, data from adapters, bridges, router, hubs—even servers—is synthesized to present network managers with a holistic view of their network. You can finally give up managing arcane devices and start managing the network system.

Sure, I know we've had some integration before. Network management platforms such as SunNet Manager can draw and display information from different devices.

In the workgroup arena, Intel has put together a management architecture that will trigger actions in response to information provided by PCs, file servers, hub cards, fax servers, and backup servers.

What Intel promises for workgroup management, 3Com hopes to deliver for infrastructure management. With 3Com's new Transcend product, customers can define logical groups that integrate data from multiple devices. A server may reside in the server group; sit with a group of PCs, bridges, hubs, and servers in the accounting group; or reside in both simultaneously. By viewing networks as logical entities rather

than physical devices, network management products finally reflect the way people think about their networks. Rather than having to determine the components that are affected by a particular workgroup and having to set individual traps and alarms for each component, you will be able to set one global parameter.

Yeah, Frank, I know that there are going to be drawbacks: Transcend is really designed to manage just 3Com equipment. And 3Com doesn't quite go far enough: Transcend only integrates infrastructure information. I want to integrate infrastructure information with application and presentation information.

Integrated network management means fewer management packages to learn and more effective use of those packages to solve problems. By being more effective at troubleshooting, I can cut down on management costs, and that is what ultimately makes integrated network management so powerful.

THE BEST Group Scheduler

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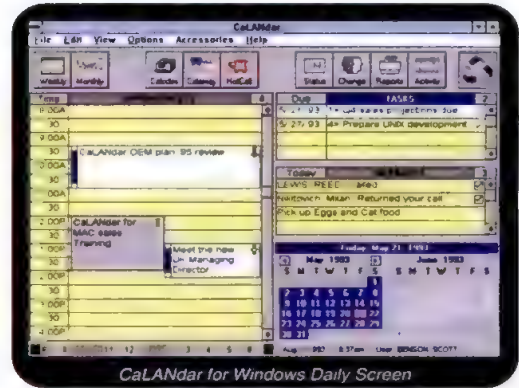
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Redirection and REM Statements

Processing Lists in Batch Files

BY NEIL J. RUBENKING

REDIRECTION AND REM STATEMENTS

I've added numerous comment lines to my AUTOEXEC.BAT file using REM statements in order to keep track of when and why I've made changes to the file. Recently I noticed I was getting "File not found" errors during execution, though my AUTOEXEC contains no illegal DOS statements or commands. By removing the initial @ECHO OFF statement from the file, I was able to determine that two REM statements were causing the problem.

The only unique element in these two REM statements was the presence of angle brackets < and > with a key name inside, such as <Alt> or <Ctrl>. When these characters were changed to hyphens, the file executed without error.

I finally figured out what was happening: < and > are DOS redirection symbols, and DOS was looking for a file for them to act on. Since my key names did not exist as filenames, DOS issued the "File not found" message. I thought REM treated *all* text in the REMed line as a comment, but obviously that is not the case!

A. Larry Aaron
Knoxville, Tennessee

► **PC MAGAZINE:** DOS sets up redirection and removes the redirection symbols and their filenames from the command line *before* executing the command, so the "File not found" error occurs before the REM command is even executed. That's why REM can't comment out redirection symbols—it never gets the chance!

There are two solutions to this problem, besides simply avoiding the three characters <, >, and | in REM lines. First, if you include the symbols in a quoted string DOS won't process them as redi-

rection symbols. For example, you could use a line like

```
REM Press "<Ctrl-C>"
```

Second, you can replace REM with a

*REM is actually a
command—though it
doesn't do anything—and
so DOS processes
redirection on REM lines.*

double colon at the start of comment lines, like this:

```
:: Press <Ctrl-C>
```

DOS treats any batch file line that begins with a colon as a nonexecutable label. The label name is after the colon. No label name can start with a colon, so a line beginning with *two* colons will never accidentally be treated as a *real* label.

The difference between the double colon and REM is that lines starting with a double colon are never executed at all. REM is actually a command—though it doesn't do anything—and so DOS processes redirection on REM lines.

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PROCESSING LISTS IN BATCH FILES

Here's a technique that can be incorporated in a batch program to process a list of items in a file. It uses DOS's internal DATE command as follows:

```
DATE < OLDLIST.DAT | FIND "Enter"  
> NEWLIST.BAT .
```

This statement converts the ASCII list file OLDLIST.DAT to the batch file NEWLIST.BAT, which treats each line in the old list as a series of command line parameters. When NEWLIST.BAT is run, it calls a batch file named ENTER.BAT that manipulates these list items as parameters.

This technique eliminates the usual need to concatenate the lines with an auxiliary file permanently residing on the disk. The file OLDLIST.DAT (which can be names of files, persons, addresses, and so forth) must have an extra carriage return/line-feed combination at the end, and it must not contain a valid DATE or any blank lines. I wrote the SWEEP.BAT batch file to illustrate how to use this technique.

SWEEP.BAT allows any file-manipulation task to be performed on the current directory and all its subdirectories. It does this by moving to each of the subdirectories, executing the task, and continuing to the next one on the list. For example, if you wanted to delete all *.BAK files in all directories, you'd just go to the root directory and issue the command SWEEP DEL * .BAK.

Arneil P. Reyes
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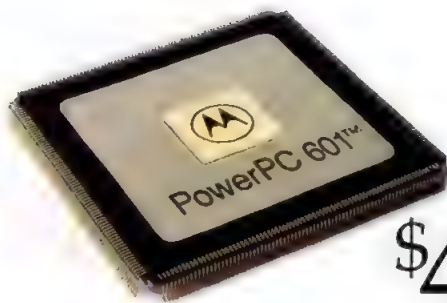
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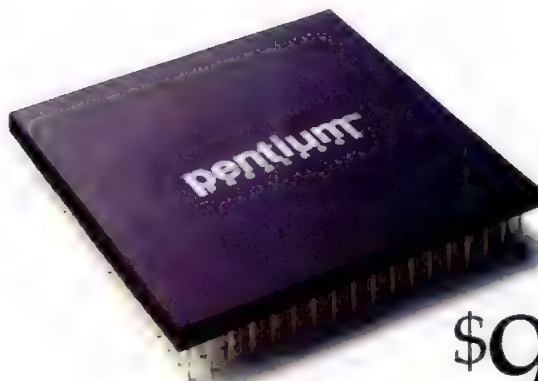
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SWEEP.BAT

Complete Listing

```
@ECHO OFF
ECHO SWEEP task [param...] - performs task on all subdirectories
IF "%1==" GOTO end

ECHO @ECHO OFF > C:\BAT\NEW.BAT
ECHO IF "%3"==" " GOTO End >> C:\BAT\NEW.BAT
ECHO CD %3 >> C:\BAT\NEW.BAT
ECHO CALL %1 %2 %3 %4 %5 %6 %7 %8 %9 >> C:\BAT\NEW.BAT
ECHO :End >> C:\BAT\NEW.BAT

DIR /A:D /B /S > C:\BAT\SWEEP$$$$.DAT
CD >> C:\BAT\SWEEP$$$$.DAT
ECHO. >> C:\BAT\SWEEP$$$$.DAT
ECHO @ECHO OFF > C:\BAT\SWEEP$$$$.BAT
DATE < C:\BAT\SWEEP$$$$.DAT | FIND "Enter" | SORT /R >> C:\BAT\SWEEP$$$$.BAT
CALL C:\BAT\SWEEP$$$
DEL C:\BAT\SWEEP$$$$.?AT >NUL
DEL C:\BAT\NEW.BAT > NUL
:End
```



Figure 1: SWEEP.BAT processes a list of directories without excessive disk activity.

HACK.BAT

Complete Listing

```
@ECHO OFF
:: HACK.BAT - hacks off a directory and everything below it
IF "%1==" GOTO end
IF NOT EXIST %1\NUL GOTO end
ECHO HACK off the directory "%1" and everything below it?
ECHO Ctrl-C to abort operation, or
PAUSE

:: HACK.BAT gets its NEW.BAT file by copying HACKNEW.BAT
COPY C:\BAT\HACKNEW.BAT C:\BAT\NEW.BAT > NUL
DIR %1 /a:d /b /s > C:\BAT\SWEEP$$$$.DAT
ECHO %1 >> C:\BAT\SWEEP$$$$.DAT

:: From this point on, HACK.BAT is identical to SWEEP.BAT
ECHO. >> C:\BAT\SWEEP$$$$.DAT
ECHO @ECHO OFF > C:\BAT\SWEEP$$$$.BAT
DATE < C:\BAT\SWEEP$$$$.DAT | FIND "Enter" | SORT /R >> C:\BAT\SWEEP$$$$.BAT
CALL C:\BAT\SWEEP$$$
DEL C:\BAT\SWEEP$$$$.?AT >NUL
DEL C:\BAT\NEW.BAT > NUL
:End
```



Figure 2: HACK.BAT uses SWEEP.BAT's technique to hack off a directory and everything below it.

HACKNEW.BAT

Complete Listing

```
@ECHO OFF
IF "%3"==" " GOTO End
ECHO Removing %3
IF NOT EXIST %3\.* GOTO Empty
ATTRIB -r -h -s %3\.* > NUL
ECHO Y | DEL %3\.* > NUL
:Empty
RD %3
:End
```



Figure 3: HACKNEW.BAT is used by HACK.BAT to process individual directories.

These are the steps:

- Prefix a batch filename to the list and store the result as a temporary batch file.
- Run the temporary batch file; this has the effect of calling the named batch file

using the first line in the list as parameters.

- Strip the first line from the temporary batch file and replace the list with the result.

- If the list is not empty, repeat the steps from the beginning.

The list file and the temporary batch file both get recreated once for each line in the list, and all that disk activity makes the process deadly slow.

The imaginative DATE/FIND technique above solves half the problem: In one step, it prefixes *every* line in the file with a known string. Each line in the resulting batch file now begins with "Enter new date (mm-dd-yy):". Executing that line calls ENTER.BAT, which can access the original line as parameters %3 and above.

But ENTER.BAT doesn't return control to the calling batch file. The original SWEEP.BAT still had to repeatedly strip off the first line and re-execute the temporary batch file. After some cogitation, I came up with a modification to avoid all of the excessive disk activity.

Slipping a CALL into the start of each line would solve the problem, but there's no easy way to do that. Renaming the CALL command to ENTER would be a solution too, but CALL is an internal command. Fortunately, DOS 5.0 does have an external command that runs other programs—LOADFIX.COM. LOADFIX does nothing but run whatever program you put on its command line while ensuring the program isn't loaded in the lowest 64K of memory. Copying LOADFIX.COM to ENTER.COM is the key to the SWEEP.BAT batch file which is shown in Figure 1. Now the effect of a line beginning with "Enter new date..." will be to run ENTER.COM, which runs NEW.BAT.

SWEEP.BAT assumes you keep your batch files in the directory C:\BAT and that C:\BAT is on the PATH. Just to be on the safe side, C:\BAT should be the first directory on the PATH. You'll want to put ENTER.COM in the C:\BAT directory, too.

SWEEP first checks to make sure you've given it something to do; if the first parameter is empty, it jumps to the end. Otherwise it builds the batch file NEW.BAT. NEW.BAT will change to the directory specified in its third parameter and then execute the commands from SWEEP.BAT's command line.

After creating NEW.BAT, SWEEP.BAT uses the DIR command (with DOS

5.0 switches) to fill the file SWEEP\$\$\$.DAT with a list of all the directories in and below the current directory. Next it appends the output of the CD command in order to put the current directory itself on the list, and then it adds a blank line at the end.

Next SWEEP.BAT builds another batch file using the DATE/FIND technique. It redirects SWEEP\$\$\$.DAT as input to the DATE command. DATE rejects each line as an invalid date and prompts for another try. The final blank line causes DATE to terminate. The output is then piped through FIND, which selects only those lines that contain the string "Enter". The output of FIND gets sorted in reverse alphabetical order and stored in the file SWEEP\$\$\$.BAT. Sorting this way ensures that any subdirectory will be processed *before* its parent directory.

Now the batch file calls SWEEP\$\$\$.BAT. Each line has the form "Enter new date (mm-dd-yy): *directoryname*". This line invokes ENTER.COM, which in turn executes NEW.BAT. NEW.BAT changes to the directory specified in its third parameter and then executes the command originally passed to SWEEP .BAT. This continues until all the lines in SWEEP\$\$\$.BAT have been executed. All that remains is to delete the temporary files. You may want to comment out the two lines that delete temporary files, in order to examine them.

Yes, this is a convoluted process, but it's actually shorter and simpler than previous list processing batch files. Eliminating the excessive disk activity makes it much faster as well. Figures 2 and 3 use the DATE/FIND technique in a batch file solution to the challenge of removing a directory and all the files and directories below it. HACK.BAT is almost identical to SWEEP.BAT, except that it gets its NEW.BAT by copying the existing file HACKNEW.BAT, and that it acts starting in the directory specified by its first parameter. If HACK.BAT doesn't get a valid directory as its first parameter, it simply quits.

I'm sure you'll find other uses for this new technique. You can download the batch files mentioned in this column from PC MagNet's Utilities/Tips Forum, archived as LIST.ZIP. □

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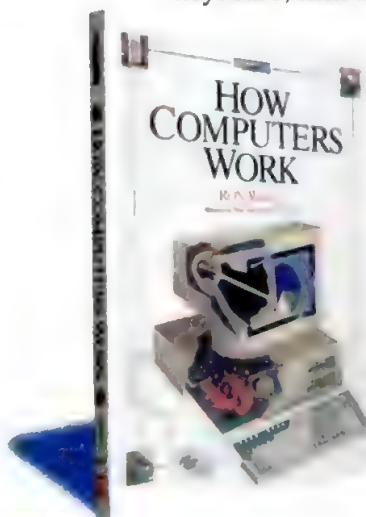
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Writing DOS Utilities with DEBUG, Part 4

BY JEFF PROSISE

So far in this Tutor miniseries, we've learned how to use programming resources in DOS and in the BIOS to create short assembly language programs with the aid of DEBUG's built-in miniassembler. In this, the fourth and final part in the series, we'll take a slightly different tack. You'll learn how to incorporate logic into your assembly programs so that they can read command line parameters—text strings typed on the command line following the program name.

Reading command line text is simpler than you might think, as long as you know a little about the *program segment prefix*, or PSP. The PSP is a 256-byte data structure created by DOS at the beginning of every .COM program. When a .COM program begins, all four segment registers—CS, DS, ES, and SS—point to its PSP. The byte at offset 80h in the PSP contains a count of the number of characters that were entered after the program name. The characters themselves follow, beginning at offset 81h. The end of the command line text is marked by an ASCII carriage return—a byte whose value is 0Dh. The character count in the byte at offset 80h does not include the terminating carriage return.

Figure 1 was produced using DEBUG's D (dump) command with the address of a program's PSP. It shows what the second half of the PSP looks like for a program that was invoked with the command

```
ANYPROG PARAM1 PARAM2
```

Offsets from the start of the PSP appear in the leftmost column. The count byte at offset 80h holds 0Eh, which is equal to the number of characters in the string "PARAM1 PARAM2," plus a

leading space (the space that separates ANYPROG from PARAM1). Beginning at offset 81h, you see the text of the command line itself, and at offset 8Fh, you see the terminating carriage return. DOS does not automatically capitalize command line text; it's capitalized here because it was entered that way on the command line. Certain exceptions aside

*Our assembly language
miniseries concludes as
we show how to build a
program that can read
command line parameters.*

(for example, when the command line includes a redirection or piping operator, in which case COMMAND.COM strips out the operator and any text that is associated with it), DOS creates a faithful duplicate of the command line in the PSP, even preserving the case of individual characters.

If you're programming in a high-level language such as C, you can access command line parameters using constructs such as `*argv[]`. In assembly language, there are no such constructs. It's up to

you to go into the PSP and manually evaluate, or *parse*, the text entered on the command line (in C, the compiler inspects the PSP for you and fills in the `*argv[]` array with the addresses of the individual command line parameters).

There are other less obvious considerations, too. A well-written program, for instance, should not care if the user entered two spaces instead of one after the program name. Nor should it falter if the user entered tabs instead of spaces.

TOGGING NUMLOCK Last issue we wrote a program, NUMOFF.COM, that turned off the NumLock key. Suppose you want a utility that turns NumLock off or on depending on how the user entered the command. Typing NUMLOCK + would enable NumLock, while typing NUMLOCK- would disable it.

Last time we learned how to turn NumLock on and off by manipulating bit 5 of the byte at 40:17. (As a refresher, setting bit 5 to 0 disables NumLock; setting it to 1 enables NumLock. Individual bits are set—made equal to 1—by ORing them with 1 and are cleared—made equal to 0—by ANDing them with 0.)

So the program must read the command line from the PSP to determine whether the user entered + or -. We also want it to display the message "Syntax: NUMLOCK + or NUMLOCK -" when the user enters anything other than + or -

Hex Dump of a Command Line

```
0080 0E 20 50 41 52 41 4D 31-20 50 41 52 41 4D 32 0D .PARAM1 PARAM2.
0090 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
00A0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
00B0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
00C0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
00D0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
00E0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
00F0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
```

Figure 1: When COMMAND.COM launches a program, it copies any text entered on the command line after the program name to the program's PSP, starting at offset 81h. The byte at offset 80h contains a count of the characters entered, not including the terminating carriage return (ASCII 0Dh).

as a parameter, or if no parameter is entered at all.

The DEBUG script in Figure 2 shows how it's done. You don't have to enter the comments that appear after the semicolons; they're included for instructional purposes only. The script contains two instructions that you haven't seen before: CLD and LODSB. CLD stands for *clear direction flag*; LODSB stands for *load string byte*. LODSB performs two actions: First it copies the byte pointed to by DS:SI into the AL register; then it increments or decrements SI by 1 in anticipation of another LODSB instruction.

The direction flag (a bit-sized flag in the CPU's FLAGS register) determines whether SI is incremented or decremented. CLD clears the direction flag so that SI will be incremented each time LODSB is called. The counterpart to CLD is STD, which sets the direction flag and decrements SI with each call to LODSB. The LODSB instruction makes it easy for assembly language programs to read sequences of bytes (byte strings). To read a string from left to right, all you have to do is point SI to the start of the string, clear the direction flag, and start executing LODSB instructions.

The instructions

```
CLD
MOV SI,81
```

clear the direction flag and point SI to the start of the text entered after the command name (offset 81h within the PSP). DS already points to the PSP segment, so there's no need to load DS. Next, the instructions

```
LODSB
CMP AL,20
JZ 0104
CMP AL,09
JZ 0104
```

loop until a character that is neither a space nor a tab is reached. LODSB reads one character from the command line; after each character is read, the program loops back and reads another if the character in AL is a space (ASCII code 20h) or a tab (ASCII 09h). Once the first non-white-space character is located, the instructions

```
A 100
CLD                                ;Clear the direction flag
MOV SI,81                          ;Point SI to start of command
line
LODSB                             ;Get a character (offset = 0104)
CMP AL,20                          ;Is it a space?
JZ 0104                            ;Loop back to 0104 if it is
CMP AL,09                          ;Is it a tab?
JZ 0104                            ;Loop back to 0104 if it is
CMP AL,0D                          ;Is this the end of the line?
JZ 0134                            ;Go to the error routine if it is
CMP AL,2B                          ;Is the character a plus sign?
JNZ 0121                           ;Jump to 0121 if it is not
MOV AX,40                          ;Set AX equal to 40h
MOV DS,AX                          ;Set DS equal to 40h
OR BYTE PTR [17],20                ;Set bit 5 of the byte at 40:17
JMP 012F                           ;Jump and exit
CMP AL,2D                          ;Is the character a minus sign?
JNZ 0134                           ;Go to error routine if it is not
MOV AX,40                          ;Set AX equal to 40h
MOV DS,AX                          ;Set DS equal to 40h
AND BYTE PTR [17],DF               ;Clear bit 5 of the byte at 40:17
MOV AX,4C00                        ;Terminate with an exit code
INT 21                            ;equal to 0 (normal termination)
MOV AH,09                          ;Error routine (offset = 0134)
MOV DX,0140                        ;Print error message using DOS
INT 21                            ;function 09h (Output String)
MOV AX,4C01                        ;Terminate with an exit code
INT 21                            ;equal to 1 (error termination)
DB "Syntax: NUMLOCK + or NUMLOCK -$"

N NUMLOCK.COM
RCX
5F
W
Q
```

Figure 2: This DEBUG script creates a utility that lets you turn NumLock on or off with the + or - parameters and displays a syntax message if you enter something else.

```
CMP AL,0D
JZ 0134
```

jump to the part of the program that displays an error message if the character is a carriage return, signifying that the end of the line was reached. The error handler looks like this:

```
MOV AH,09
MOV DX,0140
INT 21
MOV AX,4C01
INT 21
```

The first three instructions display the error message using DOS function 09h. Function 09h uses DS:DX as the address of the ASCII string (which must end with a dollar sign) to display. The MOV DX, 0140 statement loads DX with the offset address of the text string defined at the end of the program. DS already

points to the code segment, so again there's no need to load DS. This is the easiest way to output messages to the screen from assembly language programs. The final two instructions terminate the program with an exit code of 1.

After verifying that AL holds a valid character and not an end-of-line token, NUMLOCK executes the instructions

```
CMP AL,2B
JNZ 0121
MOV AX,40
MOV DS,AX
OR BYTE PTR [17],20
JMP 012F
```

The CMP and JNZ instructions branch to offset 0121h if the character read from the command line is not a plus sign (ASCII 2Bh). If it is a plus sign, then the next four instructions enable NumLock by pointing DS to the BIOS data area (segment 40h) and setting bit 5 of the byte

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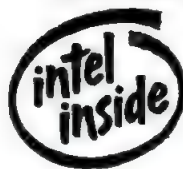
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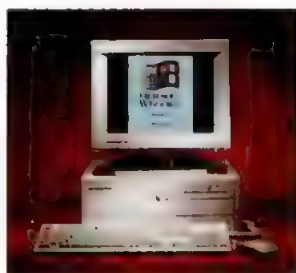


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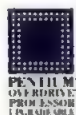


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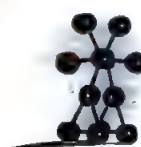
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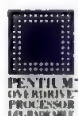
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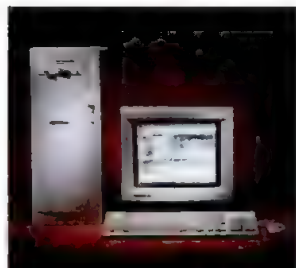
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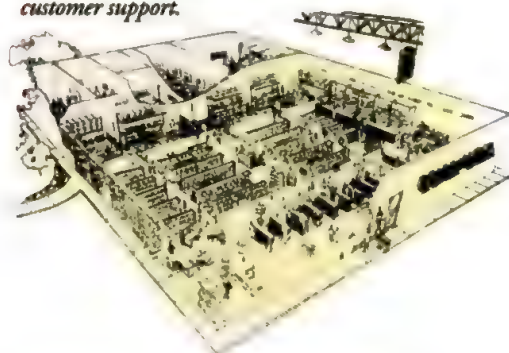
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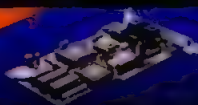
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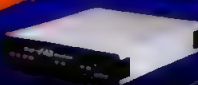


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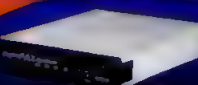


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Using the FileCdr Function to Log File Events in Windows

BY NEIL J. RUBENKING

The next time you run the Windows File Manager, try something: Start Notepad and use it to create a new file in the directory that File Manager is currently displaying. Notice that the new file immediately appears in the File Manager window. Now how, without first checking the disk, does File Manager know that you've created a file? It's not psychic; rather, it's making use of an undocumented Windows function called FileCdr.

The FileCdr function allows File Manager to install a special type of *callback function*. Callback functions are called directly by Windows itself, and the particular callback function that FileCdr installs is notified every time a file event occurs in any Windows application running on the machine. Indeed, provided that Windows is in 386 Enhanced mode and the [386Enh] section of SYSTEM.INI contains the FileSysChange=ON key, even a file event in a DOS box will be reported. In both cases, Windows uses the undocumented WM_FILESYSCCHANGE message (0034h) to notify the function.

Although one program at a time can use FileCdr, that program doesn't have to be File Manager. If you know how to use FileCdr, you can give the programs you write the ability to detect all the file events that occur in all simultaneously running sessions, DOS or not. For example, you might use FileCdr to create a Windows system monitor utility that tracks file activity. Or you might create a logging program that reports which files have been created, deleted, or changed each day.

In this Lab Notes, I'll illustrate the working of FileCdr by using a DLL (written in Borland Pascal) that installs and

uninstalls a FileCdr callback function. The DLL presented here includes special support for the very popular Visual Basic language, since VB programs can't use callback functions or respond to arbitrary Windows messages without a bit of help. You can download the source code and the compiled form of all files associated with this Lab Notes from PC MagNet's Programming Forum (GO ZNT:PROGRAM), section 5, under the filename FILCDR.ZIP.

With the explanation and code examples presented here, you can write file-tracking programs not only in conventional languages but in Visual Basic as well.

WHAT IS A FILE EVENT? Windows notifies the FileCdr callback function when one of nine specific file events occurs in a Windows application. For each event, Windows sends an action code and a string containing the name of the file involved. The action code is the value in the AX register for the INT 21h function call that caused the file event, with the high byte of the code actually defining the event. The nine codes are

- 39h: Create directory.
- 3Ah: Delete directory.
- 3Ch: Create file.
- 41h: Delete file.
- 43h: Set file attributes.
- 56h: Rename file or directory.
- 5Ah: Create unique file.

- 5Bh: Create new file.
- 6Ch: Extended file open.

Two of these codes are rarely used. Function 5Ah creates a temporary file whose name is guaranteed to not conflict with an existing file in the same directory. Function 5Bh uses a name specified by the program to open a new file, but only if no file by that name already exists.

The "extended file open" function, 6Ch, lets the calling program specify the file open mode, file attributes, and action to be taken if the file exists. File Manager uses this function in copying files. *Undocumented Windows* (Schulman and others, Addison-Wesley, 1992), my original source for information about FileCdr, states that function 57h ("set file date/time") also causes an event, but in my experience this appears to be incorrect.

Since FileCdr is undocumented, it's not as tidy as the documented Windows API functions, so it's not terribly surprising that Windows uses a completely different set of action codes for file events that happen to occur in DOS boxes:

- 0: Create file, unique file, or new file.
- 1: Delete file.
- 2: Rename file or directory.
- 3: Set or get file attributes.
- 7: Create a directory.
- 8: Remove a directory.

Note that in a DOS box, Windows lumps the "create new file" and "create unique file" functions together with "create file," returning a code of 0 for all of them. Also, in a DOS box, no message is sent for the "extended file open" function (6Ch).

INSTALLING AND USING FILECDRL FILE-CDRL.PAS, listed in Figure 1, is a DLL that handles installing and uninstalling a FileCdr callback function called FileCdr-Proc. It's written in Borland Pascal for Windows (BPW), but it can be used with any language that lets you call functions

FILECDRL.PAS

Partial Listing

```
(K+)
LIBRARY FileCdrL;
USES WinTypes, Strings, WinProcs;
($D Copyright (c) 1993 by Neil J. Rubenking)
CONST
  WM_FILESYSCHANGE = $0034;
  hWndInUse      : hWnd = 0;

FUNCTION FileCdr(FILECDRPROC : TFarProc) : LongInt; FAR;
  EXTERNAL 'KERNEL' Index 130;

PROCEDURE FileCdrProc(WActionCode : Word; lpszPath : PChar);EXPORT;
BEGIN
  SendMessage(hWndInUse, WM_FILESYSCHANGE, Hi(WActionCode),
    LongInt(lpszPath));
END;

FUNCTION FileCdrInstall(H : hWnd) : Bool; EXPORT;
BEGIN
  FileCdrInstall := FALSE;
  IF hWndInUse <> 0 THEN Exit;
  IF NOT Bool(LoWord(FileCdr(@FileCdrProc))) THEN Exit;
  hWndInUse := H;
  FileCdrInstall := TRUE;
END;

FUNCTION FileCdrUninstall(H : hWnd) : Bool; EXPORT;
BEGIN
  FileCdrUninstall := FALSE;
  IF hWndInUse = 0 THEN Exit;
  IF hWndInUse <> H THEN Exit;
  FileCdr(NIL);
  hWndInUse := 0;
  FileCdrUninstall := TRUE;
END;
```

```
END;

FUNCTION GetEventName(buff : PChar; fEvent, buflen :
  Word) : PChar; EXPORT;
BEGIN
  CASE fEvent OF
    0, $3C : StrLCopy(buff, 'Create file', buflen);
    1, $41 : StrLCopy(buff, 'Delete file', buflen);
    2, $56 : StrLCopy(buff, 'Rename file/dir', buflen);
    3, $43 : StrLCopy(buff, 'Get/set file attr', buflen);
    (no event for GET file attr from a WinApp)
    $5A : StrLCopy(buff, 'Create unique file', buflen);
    (from DOS box, this function comes as 0)
    $57 : StrLCopy(buff, 'Set file date/time', buflen);
    (Schulman mentions this, but it don't happen)
    $5B : StrLCopy(buff, 'Create new file', buflen);
    (from DOS box, this function comes as 0)
    7, $39 : StrLCopy(buff, 'Create directory', buflen);
    8, $3A : StrLCopy(buff, 'Delete directory', buflen);
    $6C : StrLCopy(buff, 'Extended open', buflen);
    (from DOS box, this function is ignored)
    ELSE StrLCopy(buff, 'UNKNOWN', buflen);
  END;
  GetEventName := buff;
END;

EXPORTS
  FileCdrInstall      INDEX 1,
  FileCdrUninstall    INDEX 2,
  GetEventName        INDEX 3;
BEGIN
END;
```



Figure 1: This dynamic link library allows a program to receive notification of every file event in any Windows application or DOS box.

CRTLOG.PAS

Complete Listing

```
(SK+)
PROGRAM CrtLog;
USES WinCrt, WinTypes, WinProcs, Strings, Win31, FileCdrImport;
CONST
  AppName : PChar = 'CrtLog';
  MsgName : PChar = 'CrtLog Message';
  wm_FileSysChange = $0034;
VAR
  CrtHandle : hWnd;
  OldProc : TFarProc;

PROCEDURE CheckINI;
VAR Value : ARRAY[0..255] OF Char;
BEGIN
  GetPrivateProfileString('386Enh', 'FileSysChange', '', Value, 256,
    'SYSTEM.INI');
  IF StrComp(Value, 'ON') <> 0 THEN
    BEGIN
      MessageBeep(mb_IconQuestion);
      IF MessageBox(CrtHandle, 'Windows is not set up to receive '+
        'notification of file activity in DOS boxes. Enable this '+
        'feature and restart Windows?', MsgName,
        mb_YesNo + mb_IconQuestion) = id_Yes THEN
        BEGIN
          WritePrivateProfileString('386Enh', 'FileSysChange',
            'ON', 'SYSTEM.INI');
          ExitWindows(ex_RestartWindows, 0);
        END;
    END;
  END;

FUNCTION NewWinProc(Window : hWnd; Message, wParam : Word;
  lParam : LongInt) : LongInt; EXPORT;
VAR buff : ARRAY[0..255] OF Char;
BEGIN
  NewWinProc := CallWindowProc(OldProc, Window, Message, wParam,
    lParam);
  CASE Message OF
    wm_Close : FileCdrUninstall(CrtHandle);
    wm_FileSysChange : BEGIN
```

```
IF wParam > 9 THEN Write('W ') ELSE Write('D ');
  Write(GetEventName(buff, wParam, 255), '20-StrLen(buff));
  StrCopy(buff, PChar(lParam));
  IF (wParam = 2) OR (wParam = $56) THEN
    BEGIN
      StrCat(buff, ' TO ');
      StrCat(buff, StrEnd(PChar(lParam))+1);
    END;
  WriteLn(StrUpper(buff));
END;
END;

BEGIN
  IF GetWinFlags AND WF_ENHANCED = 0 THEN
    MessageBox(0, 'Because Windows is not in 386 Enhanced mode, '+
      'CrtLog will not be able to log file events occurring in DOS '+
      'boxes', MsgName, mb_Ok + mb_IconInformation);
  ELSE CheckINI;
  ScreenSize.X := (GetSystemMetrics(sm_CXScreen) -
    GetSystemMetrics(sm_CXVScroll)) -
    GetSystemMetrics(sm_CXFrame) DIV 8;
  ScreenSize.Y := 65520 DIV ScreenSize.X;
  AutoTracking := FALSE;
  StrCopy(WindowTitle, 'CrtLog Window');
  StrCopy(InactiveTitle, 'CrtLog Window');
  InitWinCrt;
  CrtHandle := GetActiveWindow;
  IF NOT FileCdrInstall(CrtHandle) THEN
    BEGIN
      MessageBox(CrtHandle, 'The FileCdr function is already in use '+
        'by another program - probably File Manager.', MsgName,
        mb_Ok + mb_IconStop);
      DoneWinCrt;
    END;
  OldProc := TFarProc(GetWindowLong(CrtHandle, gwl_WndProc));
  SetWindowLong(CrtHandle, gwl_WndProc, LongInt(@NewWinProc));
END;
```



Figure 2: The CrtLog program uses the FileCdrL DLL to log all file events in a scrolling text window.

in DLLs, install callback functions, and respond to arbitrary Windows messages. The FileCdrL program exports three main functions: FileCdrInstall, FileCdrUnInstall, and GetEventName. The exported functions can be called from programs written in any language, though

the exact syntax used will depend on which language is used.

The calling program passes its own window handle to the Boolean function FileCdrInstall. The first thing FileCdrInstall does is check whether the DLL is already in use by another program. This

check is made by testing whether the typed constant hWndInUse is nonzero. If so, the function immediately returns FALSE. Otherwise, it calls FileCdr to install the callback function FileCdrProc. Again, FALSE is immediately returned if the installation fails. If the callback

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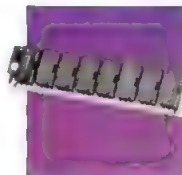
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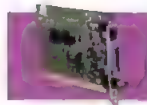
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function is installed successfully, FileCdrInstall indicates that the DLL is now in use by storing the calling program's window handle in hWndInUse and then returning TRUE.

Any program that installs a FileCdr callback function must be sure to uninstall it before terminating; otherwise Windows may attempt to call the function after the program has ended, which will result in a General Protection Fault. In FileCdrL, this protection is handled by the Boolean function FileCdrUnInstall, which takes the calling program's window handle as its only parameter. If hWndInUse is zero, or is not equal to the passed window handle, it immediately returns FALSE. Otherwise, FileCdrUnInstall calls the FileCdr function and passes NIL as the function address, which uninstalls the callback function. Then it sets hWndInUse back to zero in preparation for use by another program.

The FileCdrProc callback function itself is extremely simple. Windows passes it an action code and a string pointer that contains the name of the file involved. FileCdrProc sends a WM_FILE message to the window whose handle is contained in hWndInUse, passing along the string pointer and the high byte of the action code word. So whether a file event occurs in a DOS box or in a Windows application, the calling program will receive notification the same way; namely, through a WM_FILESYSCHANGE message.

GetEventName, the third function exported by the FileCdrL DLL, makes it easy for programs using FileCdr to display their results. Given a Windows or DOS action code, it returns the name of the corresponding event. Note that GetEventName includes an entry for function 57h ("set file date/time"), just in case Windows does under some circumstance send notification of that event.

THE CRTLOG PROGRAM A DLL does nothing by itself—it goes into action only when a program calls on its functions. The program CRTLOG.PAS, listed in Figure 2, tests the functions of the FileCdrL library. CrtLog relies on the unit FILECDRI.PAS, shown in Figure 3, to import the necessary functions from the DLL. You can use this unit to add FileCdr support to any Borland Pascal program.

CrtLog also makes use of the standard WinCrt unit, which creates a scrolling window that makes displaying a line of text as easy as calling the WriteLn function. When loaded, CrtLog uses this window to show you information about every file event that occurs.

Remember that FileCdr can log file events in DOS boxes only when Windows is running in 386 Enhanced mode. Thus, CrtLog starts by checking whether Windows is in this mode. If not, it warns you that it won't be able to log file events in DOS boxes. Otherwise, CrtLog checks SYSTEM.INI to be sure the FileSysChange=ON key is present in the [386Enh] section. If that key is absent, CrtLog offers to enable it and restart Windows.

The default WinCrt window simulates an old-fashioned 80-by-25 character display, but this is not what CrtLog needs. Specifically, a single line of output for a rename event potentially includes two full pathnames, and allowing long lines to wrap at 80 characters would make the display difficult to read. CrtLog avoids this difficulty by setting the WinCrt variable ScreenSize.X to allow the widest possible display. The interior width of the largest possible window is then calculated and divided by 8, the standard width of WinCrt characters. ScreenSize.Y defines the maximum number of lines the window will hold. CrtLog simply sets this to the largest value that keeps the product of ScreenSize.X and ScreenSize.Y within the WinCrt limit of 65,520. By setting the variable AutoTracking to FALSE, the window does not have to scroll to keep the current line in view. This speeds the program's operation.

With the output window prepared, CrtLog is ready to install the FileCdr callback function—and here it runs into trouble. In order to install the function, CrtLog must pass the handle of its own main window. By a peculiar oversight, however, Borland hid the window handle for a WinCrt program, making it inaccessible to the program. Thus, immediately after initializing the window with InitWinCrt, CrtLog must resort to calling GetActiveWindow. Only then does it attempt to actually install the FileCdr callback. Now if the attempt fails, it informs the user that FileCdr is already in use and the program terminates.

With the FileCdr callback in place, CrtLog needs a way to respond to the WM_FILESYSCHANGE message. It can do that easily by subclassing its main window to add handling for WM_FILESYSCHANGE and to modify the handling of WM_CLOSE. The last two lines in the main body of the program save the old window procedure and install the function NewWinProc as the program's new window procedure. Borland Pascal for Windows' smart callback feature, enabled by the {\$K+} compiler directive at the top of the program, eliminates the need to create a procedure instance of the new window procedure.

All Windows messages directed to CrtLog now come directly to the function NewWinProc, which immediately passes them along for processing by the old window procedure. CrtLog then provides special handling for two particular messages. If the message is WM_CLOSE, it performs the all-important uninstallation of the FileCdr callback function. If a WM_FILESYSCHANGE message is re-

FILECDRI.PAS

Complete Listing

```
UNIT FileCdrImport;
{Import unit for FileCdrL Library}
(**) INTERFACE (**)
USES WinTypes;

FUNCTION FileCdrInstall(H : hWnd) : Bool;
FUNCTION FileCdrUninstall(H : hWnd) : Bool;
FUNCTION GetEventName(buff : PChar; fEvent, buffLen : Word) : PChar;

(**) IMPLEMENTATION (**)
FUNCTION FileCdrInstall; EXTERNAL 'FILECDRL' Index 1;
FUNCTION FileCdrUninstall; EXTERNAL 'FILECDRL' Index 2;
FUNCTION GetEventName; EXTERNAL 'FILECDRL' Index 3;
END.
```

Figure 3: An import unit like this makes it easy to use DLL functions in a Borland Pascal program.



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CRTLOG.OUT

Partial Listing

```

(W) Create directory      E:\LAB\LOG\MKDIR.39H
(W) Rename file/dir      E:\LAB\LOG\MKDIR.39H TO RENDIR.56H
(W) Create file          E:\LAB\LOG\RENDIR.56H\CREATE.3CH
...
(W) Create unique file   E:\AJDHCNBC
(W) Create new file      E:\LAB\LOG\RENDIR.56H\NEW_FILE.5AH
(W) Extended open       E:\EXT_OPEN.6CH
(W) Rename file/dir      E:\LAB\LOG\RENDIR.56H\CREATE.3CH TO RENAME.56H
(W) Get/set file attrs   E:\LAB\LOG\RENDIR.56H\SET_ATTR.43H
(W) Delete file          E:\LAB\LOG\RENDIR.56H\RENAME.56H
...
(W) Delete directory     E:\LAB\LOG\RENDIR.56H
(D) Create directory     E:\LAB\LOG\MKDIR.39H
(D) Rename file/dir      E:\LAB\LOG\MKDIR.39H TO E:\LAB\LOG\RENDIR.56H
(D) Create file          E:\LAB\LOG\RENDIR.56H\CREATE.3CH
...
(D) Create file          E:\AJDIAJAM
(D) Create file          E:\LAB\LOG\RENDIR.56H\NEW_FILE.5AH
(D) Rename file/dir      E:\LAB\LOG\RENDIR.56H\CREATE.3CH TO
E:\LAB\LOG\RENDIR.56H\RENAME.56H
(D) Get/set file attrs   E:\LAB\LOG\RENDIR.56H\GET_ATTR.43H
(D) Get/set file attrs   E:\LAB\LOG\RENDIR.56H\SET_ATTR.43H
(D) Delete file          E:\LAB\LOG\RENDIR.56H\RENAME.56H
...
(D) Delete directory     E:\LAB\LOG\RENDIR.56H

```

Figure 4: This is a partial listing of the events logged by CrtLog after running both the TESTCDRW.EXE and TESTCDRL.EXE programs.

ceived, CrtLog writes a report line to the log window.

The report line starts with (W) or (D) (indicating if the file event happened in a Windows or DOS application), followed by the event's name. The function then copies the passed filename into a local buffer, since programs should not attempt to directly manipulate the string passed with WM_FILESYSCHANGE. If the message involves renaming a file,

a second filename immediately follows the first, and the function appends the second filename to the buffer. To complete the line, NewWinProc writes out the filename(s) in uppercase.

To see CRTLOG.EXE in action, run it and then perform a few file actions: Create a test directory, copy some files into it, rename the files, delete them, and so on. You can use File Manager for this, as long as you load it after CrtLog. If

you're running in 386 Enhanced mode and SYSTEM.INI contains the necessary FileSysChange=ON line, you can also test the program from a DOS box.

To give CrtLog a really thorough workout, however, you should run the programs TESTCDRW.EXE and TESTCDRL.EXE. They're both included in the downloadable file for this Lab Notes. These programs test every one of the file actions in DOS and Windows. Figure 4 shows a partial list of the contents of the CrtLog window after both test programs have been executed.

ADAPTING FILECDR TO VISUAL BASIC Visual Basic's latest version, 3.0, lets you accomplish more with less code than ever. However, it remains bound by certain limitations. Although a VB program can call DLL functions, you still can't write a DLL in VB. Moreover, the only way to install a callback function or respond to an arbitrary Windows message in a VB program is to use a custom control or a DLL written in another language. Figure 5 shows the code I added to FILECDRL.PAS to enable Visual Basic programs to receive notification of file events using the FileCdr function.

FileCdrInstallVB installs a FileCdr callback function written to get around the limitations of Visual Basic. It takes one more parameter than the original FileCdrInstall did. FileCdrInstallVB's TextH parameter must be the window handle of an invisible text box within the

FILECDRL.PAS

Partial Listing

```

CONST TextHandle : hWnd = 0;
VAR OldProc      : TFarProc;

PROCEDURE SendVbMessage(wAc : Word; lpszPath : PChar);
  (used by both FileCdrProcVB and NewVbWinProc)
VAR
  Len, fBegin : Word;
  P           : PChar;
BEGIN
  Len := StrLen(lpszPath) + 30;
  CASE wAc OF
    2, $56 : Inc(Len, StrLen(StrEnd(lpszPath)+1));
  END;
  GetMem(P, Len);
  (start with W for Windows or D for DOS box)
  IF wAc > 9 THEN StrCopy(P, '[W]') ELSE StrCopy(P, '[D]');
  (insert the event name starting at 4th char)
  GetEventName(P+4, wAc, Len);
  fBegin := StrLen(P);
  StrCat(P, #9);
  (append the file name)
  StrCat(P, lpszPath);
  (if RENAME, append the OTHER file name)
  IF (wAc = 2) OR (wAc = $56) THEN
    BEGIN
      StrCat(P, ' TO ');
      StrCat(P, StrEnd(lpszPath)+1);
    END;
  (uppercase the filename portion only)
  StrUpper(P + fBegin);

```

```

  SendMessage(TextHandle, WM_SETTEXT, 0, LongInt(P));
  FreeMem(P, Len);
END;

PROCEDURE FileCdrProcVB(wActionCode : Word; lpszPath : PChar); Export;
BEGIN
  IF hWndInUse = 0 THEN Exit;
  SendVbMessage(HI(wActionCode), lpszPath);
END;

FUNCTION NewVbWinProc(Window : hWnd; Message, wParam : Word;
  lParam : LongInt) : LongInt; EXPORT;
BEGIN
  NewVbWinProc := CallWindowProc(OldProc, Window, Message, wParam,
    lParam);
  IF Message = WM_FILESYSCHANGE THEN
    SendVbMessage(wParam, PChar(lParam));
  END;
END;

FUNCTION FileCdrInstallVB(H, TextH : hWnd) : Bool; Export;
BEGIN
  FileCdrInstallVB := FALSE;
  IF hWndInUse <> 0 THEN Exit;
  IF NOT Bool(LowWord(FileCdr(@FileCdrProcVB))) THEN Exit;
  hWndInUse := H;
  TextHandle := TextH;
  OldProc := TFarProc(GetWindowLong(hWndInUse, gwl_WndProc));
  SetWindowLong(hWndInUse, gwl_WndProc, LongInt(@NewVbWinProc));
  FileCdrInstallVB := TRUE;
END;

```

Figure 5: The functions shown here were added to FILECDRL.PAS in order to support use of FileCdr by Visual Basic programs.

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VBLOG

Complete Listing

```

1) ' declarations for access to FileCdrL DLL
2) Declare Function FileCdrInstallVB Lib "FILECDRL.DLL" (ByVal H%, ByVal TextH%)
3) Declare Function FileCdrUninstall Lib "FILECDRL.DLL" (ByVal H%)
4) ' declarations for Windows API functions
5) Declare Function GetWinFlags Lib "Kernel" ()
6) Declare Function GetPrivateProfileString Lib "Kernel" (ByVal lpApplicationName$,
ByVal lpKeyName$, ByVal lpDefault$, ByVal lpReturnedString$, ByVal nSize$, ByVal lpFileName$)
7) Declare Function WritePrivateProfileString Lib "Kernel" (ByVal lpApplicationName$, ByVal lpKeyName$, ByVal lpstring$, ByVal lpFileName$)
8) Declare Function ExitWindows Lib "User" (ByVal dwReturnCode$, ByVal Reserved$)
9) ' constants used by Windows API functions
10) Const EW_RESTARTWINDOWS = &H42
11) Const WF_ENHANCED = &H20
12)
13) Dim Loaded%
14)
15) Sub Form_Load ()
16)   If GetWinFlags() And WF_ENHANCED = 0 Then
17)     MsgBox "Because Windows is not in 386 Enhanced mode, VBlog will not be able to log file events occurring in DOS boxes", MB_OK
+ MB_ICONINFORMATION, "VBlog Message"
18)   Else
19)     Valu$ = String$(20, #)
20)     Success% = GetPrivateProfileString("386Enh", "FileSysChange", "", Valu$, Len(Valu$), "SYSTEM.INI")
21)     Valu$ = Left$(Valu$, Success%)
22)     If Valu$ <> "ON" Then
23)       If MsgBox("Windows is not set up to receive notification of file activity in DOS boxes. Enable this feature and restart Windows?", MB_YESNO
+ MB_ICONQUESTION, "VBlog Message") = IDYES Then
24)         Success% = WritePrivateProfileString("386Enh", "FileSysChange", "ON", "SYSTEM.INI")
25)         If Success% Then Success% = ExitWindows(EW_RESTARTWINDOWS, 0)
26)       End If
27)     End If
28)   End If
29)   'set up the first four grid column widths
30)   Grid1.ColWidth(0) = 1200
31)   Grid1.ColWidth(1) = 1000
32)   Grid1.ColWidth(2) = 400
33)   Grid1.ColWidth(3) = 1800
34)   ' first row initially NOT fixed, so we can use AddItem
35)   Grid1.AddItem "Date" + Chr$(9) + "Time" + Chr$(9) + "OS" + Chr$(9) + "Event" + Chr$(9) + "File name(s)"
36)   ' remove empty line
37)   Grid1.RemoveItem 0
38)   If FileCdrInstallVB(Form1.hwnd, Invisible_Text.hwnd) = 0 Then
39)     MsgBox "Unable to install VB Log. FileCdr is in use by another program - probably File Manager", MB_OK + MB_ICONINFORMATION, "VB Log Message"
40)     Loaded% = False
41)     Unload Form1
42)   Else
43)     Loaded% = True
44)   End If
45) End Sub
46)
47) Sub Form_Resize ()
48)   Grid1.Move 0, 0, ScaleWidth, ScaleHeight
49)   Grid1.ColWidth(4) = ScaleWidth
50) End Sub
51)
52) Sub Form_Unload (Cancel As Integer)
53)   If Loaded% Then
54)     If FileCdrUninstall(Form1.hwnd) = 0 Then
55)       MsgBox "The FileCdr function could not be uninstalled. You may have to restart Windows to regain access to FileCdr.", MB_OK
+ MB_ICONINFORMATION, "VB Log Message"
56)     End If
57)   End If
58) End Sub
59)
60) Sub Invisible_Text_Change ()
61)   Grid1.AddItem Date$ + Chr$(9) + Time$ + Chr$(9) + Invisible_Text.Text
62)   ' It is not possible for a grid to have just ONE row
63)   ' and have that row be a fixed row. Thus we do not
64)   ' make it fixed until after another row has been added.
65)   If Grid1.FixedRows = 0 Then Grid1.FixedRows = 1
66) End Sub

```



Figure 6: This tiny Visual Basic program logs file events in an impressive grid-type display.

calling program. (In VB terms, that handle is known as the text box's *hWnd* property.) The DLL will communicate with the calling program by sending WM_SETTEXT messages to this invisible text box. In the VB program, the text box's Change method can be used to dispatch each received string to another part of the program; for example, to a list box.

FileCdrInstallVB also has to subclass the VB program's main window in order to trap WM_FILESYSCCHANGE messages sent to that window. Like the sub-

class window procedure in CrtLog, the procedure NewVBWinProc starts by passing all messages to the original window procedure. Afterward, if the message is WM_FILESYSCCHANGE, it calls the procedure SendVBMessage. Both the window procedure and the FileCdr callback call on SendVBMessage to transmit information to the VB program.

SendVBMessage builds a three-part string that is very similar to the report lines in CrtLog. The first part is either (W) or (D), depending on whether the

message came from a WinApp or a DOS box. The second part is the name of the event, and the third part is the filename or names. Tab characters separate the three parts. After building this string, SendVBMessage calls the Windows API function SendMessage to pass it to the VB text box in the form of a WM_SETTEXT message.

THE VBLOG PROGRAM With the support DLL FileCdrL in place, it's easy to create a VB program that makes use of these functions. Figure 6 contains the text for

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Max. Resolution	1024x768/87Hz	1024x768/60Hz	1024x768/72Hz	1024x768/72Hz	1024x768/72Hz	1280x1024/60Hz
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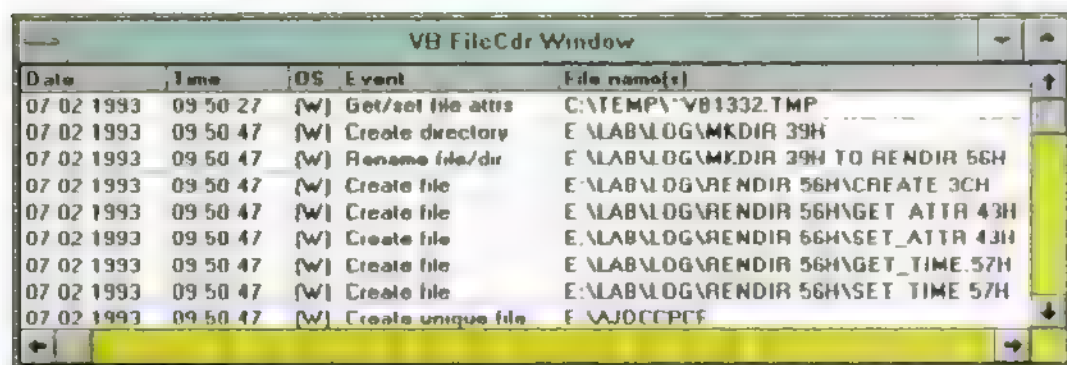
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Date	Time	OS	Event	File name(s)
07/02/1993	09:50:27	(W)	Get/set file attr	C:\TEMP\VB1332.TMP
07/02/1993	09:50:47	(W)	Create directory	E:\LAB\LOG\MKDIR 39H
07/02/1993	09:50:47	(W)	Rename file/dir	E:\LAB\LOG\MKDIR 39H TO RENDIR 56H
07/02/1993	09:50:47	(W)	Create file	E:\LAB\LOG\RENDIR 56H\CREATE 3CH
07/02/1993	09:50:47	(W)	Create file	E:\LAB\LOG\RENDIR 56H\GET_ATTR 43H
07/02/1993	09:50:47	(W)	Create file	E:\LAB\LOG\RENDIR 56H\SET_ATTR 43H
07/02/1993	09:50:47	(W)	Create file	E:\LAB\LOG\RENDIR 56H\GET_TIME 57H
07/02/1993	09:50:47	(W)	Create file	E:\LAB\LOG\RENDIR 56H\SET_TIME 57H
07/02/1993	09:50:47	(W)	Create unique file	E:\LAB\LOG\RENDIR 56H\CREATE 3CH

Figure 7: Thanks to Visual Basic's grid control, the VBLog program presents a very professional-looking display.

all of the program VBLog's methods. Its main form contains just two controls: an invisible text box and a grid.

The `Form_Load` method installs the `FileCdr` callback function and subclasses the window, and the `Form_Unload` method uninstalls the callback function. The `Form_Resize` method automatically sizes the grid so it completely fills the interior of the form, and the `Invisible_Text_Change` method prefixes the current date and time to the received string and adds the result to the grid. That's the entire program!

The `Form_Load` method must call the function `FileCdrInstallVB` in `FILECDRL.DLL` in order to install the `FileCdr` callback function. Using Windows API functions—or other functions in DLLs—from within a VB program is entirely possible; it's just not easy. The VB program must include a declaration for every such function it wants to use; it must also declare any constants needed by those functions. Besides the two functions from the `FileCdr` DLL, the VBLog program declares the Windows functions `GetWinFlags`, `GetPrivateProfileString`, `WritePrivateProfileString`, and `ExitWindows`. You'll recognize these four from the initialization portion of `CrtLog`; VBLog's `Form_Load` method performs exactly the same kind of initialization.

`Form_Load` also sets the column width for the first four columns of the grid and writes the grid's fixed header row. Because of a quirk in the grid control, however, the header is not fixed initially. A grid must always have at least one non-fixed row, so when the grid starts off with just one row, that row cannot be fixed. The first time the text box's `Change` method adds another row, it converts the header row to fixed.

Should `FileCdrInstallVB` fail, VBLog

reports the problem, sets the variable `Loaded` to `FALSE`, and immediately unloads itself. Otherwise, it sets `Loaded` to `TRUE`. When `Form_Unload` is called, it attempts to unload the `FileCdr` callback function only if `Loaded` is `TRUE`.

You can load VBLog and test it just as you did `CrtLog`, even using the same `TESTCDRW.EXE` and `TESTCDRD.EXE` programs. As Figure 7 shows, the resulting display is much more impressive, thanks to the grid control. If you run VBLog from within the Visual Basic environment, however, be sure to close it *only* by double-clicking its own system menu box. Otherwise, when `Form_Unload` goes to call `FileCdrUnInstall`, it may find that the DLL has already been un-

***When you use an
undocumented function,
you're taking a chance that
the next Windows version
might break your program.***

loaded. By the same token, never use the `End` statement to terminate a VB program that uses the `FileCdrL` DLL.

VBLog doesn't stay within the bounds of Visual Basic, and this sets up a few potential pitfalls. Microsoft warns that programs should not store and reuse the `hWnd` property of VB objects because the property may change during the program's execution. However, the `FileCdrL` DLL absolutely *must* retain and use both the `hWnd` of the VB program's main form and its invisible text box. Fortunately, a check with Visual Basic experts Jonathan Zuck and Dan Appleman assures me that there is no way the form `hWnd` can change while a VB program is running, and there is no reason for the text `hWnd` to change.

The fact that using `FileCdr` requires

the VB program to subclass its own main window could also cause problems in a program that already subclasses that window. For a discussion of the possible problems with subclassing, see the article "Rules of the Road," by Dan Appleman, *Windows Tech Journal*, Volume 2, Number 8, August 1993.

The safest way to avoid such troubles is to use third-party Visual Basic custom controls such as those in `SpyWorks-VB`, from Desaware. Among its many features, the Desaware package gives VB programs the ability to subclass windows safely, install callback functions, and respond to arbitrary Windows messages. And unlike other similar packages, `SpyWorks 2.0` can handle callbacks (like `FileCdr`'s) that occur outside the context of the VB program. The downloadable ZIP file containing source code for this article includes a version of VBLog that eliminates the need for a DLL by using tools from `SpyWorks`.

MONITORING YOUR SYSTEM Utilities to monitor system behavior under Windows are popular these days. If you write one, consider including an option to log file activity using `FileCdr`. My own `INCTRL` utility (*PC Magazine*, July 1992) would work faster if it relied on `FileCdr` instead of scanning the entire hard disk looking for changes. However, since `FileCdr` detects when files are created or deleted but not when an existing file is changed, `INCTRL` would thereby have lost the ability to detect changed files.

Schulman's *Undocumented Windows* shows a way to steal `FileCdr` from another program and then share it with that program. A professional utility should probably incorporate this technique so that it won't be locked out if the `File Manager` is already running. Naturally a full-featured, file-tracking utility would let you save the log information to disk.

When you use an undocumented function, you're taking a chance that the next version of Windows might break your program. However, when the function is used by something as central as `File Manager`, the risk is minimal. And in this case, I think you'll find that the benefits are substantial. □

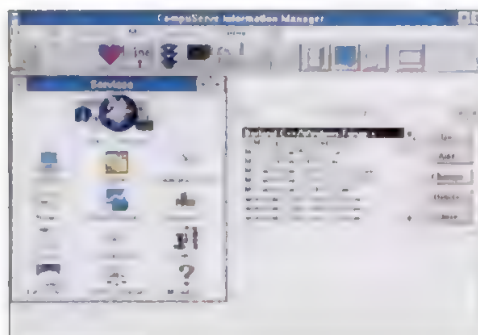
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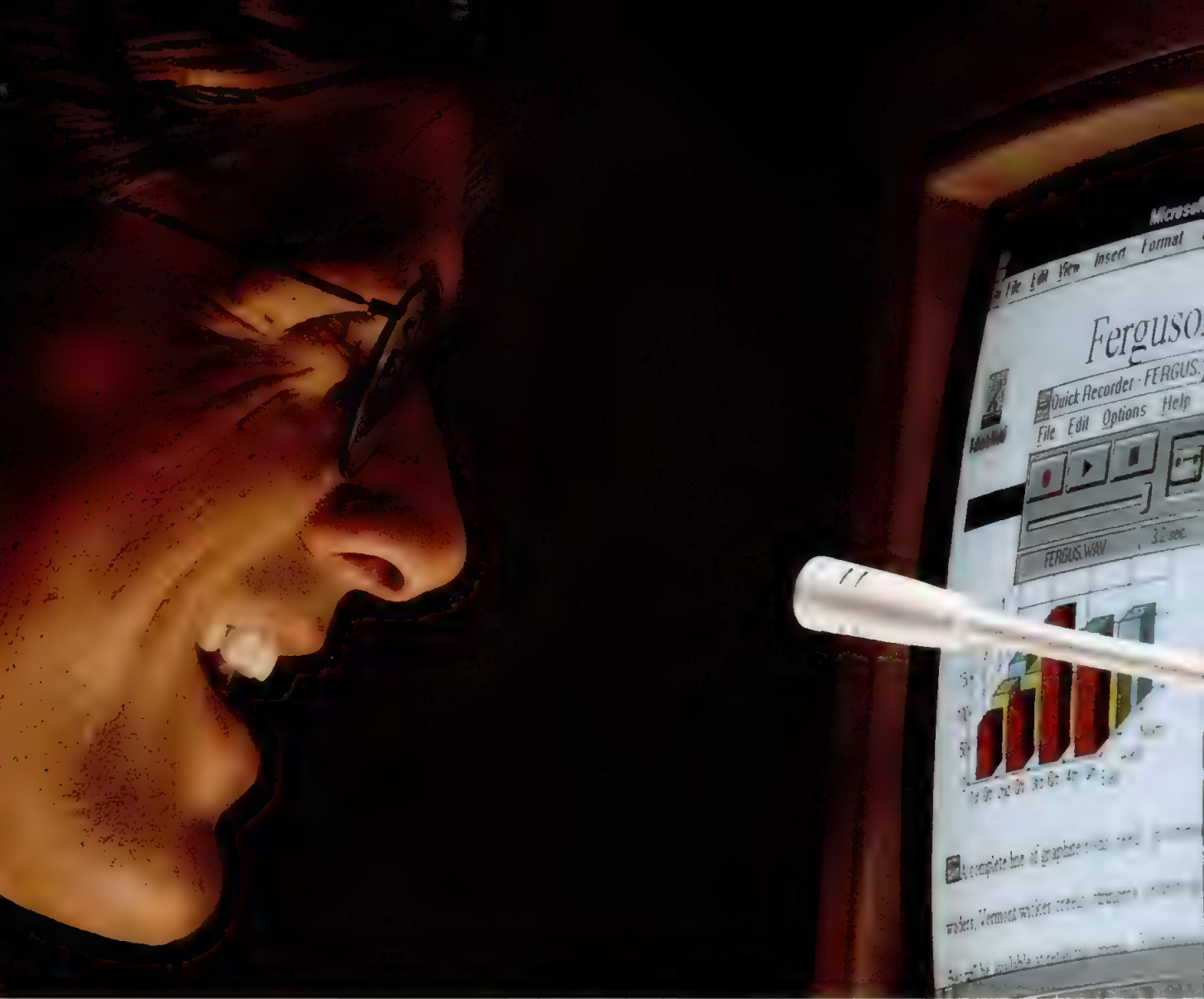
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Load Device Drivers from the DOS Prompt with DRVLOAD

BY RICK KNOBLAUGH

Device drivers provide DOS with a convenient way to support a wide variety of peripheral devices. But having to edit your CONFIG.SYS file and reboot in order to add the device= statement needed by a peripheral you don't use regularly—a CD-ROM drive or a RAM disk, for example—is anything but convenient.

DRVLOAD, this issue's free utility, eliminates that nuisance. With DRVLOAD you can load an unexpectedly needed device driver right from the DOS command prompt. Not even the multiple configuration setups provided by DOS 6.0 give you that kind of instant flexibility. And DRVLOAD works with versions of DOS from 3.0 onward.

You can get a copy of DRVLOAD from PC MagNet by following the instructions in the sidebar "How to Get PC Magazine's Utilities." If you want only the executable program, download DRVLOA.COM from the Utilities/Tips Forum. To get the complete assembly language source code and its required include files, download DRVLOA.ZIP instead. You'll need a Microsoft MASM assembler and the LINK and EXE2BIN utilities to work with the source code.

USING DRVLOAD To load a driver with DRVLOAD, simply enter the command, followed by the full device driver filename and any required driver parameters. The complete command syntax is

```
[LH] DRVLOAD [d:][path]filename
[driver_parameters]
```

For example, to install ANSI.SYS from your DOS directory on drive C:, you'd simply enter

```
DRVLOAD C:\DOS\ANSI.SYS
```

Or, to add a 32K RAM disk to the same location to speed up some sluggish disk-intensive operations, enter

```
DRVLOAD C:\DOS\RAMDRIVE.SYS 32
```

In addition to eliminating the need to edit and reboot when adding a new driver, DRVLOAD also makes it possible to load drivers conditionally, based upon user input or other considerations embedded in a batch file. And if you write

*For both installing
occasionally needed drivers
and troubleshooting new
ones, this utility can be
a real time-saver.*

device drivers, you know the difficulty associated with debugging them: Their initialization code is executed before you even get a chance to load your debugger. Since DRVLOAD simulates what DOS does at boot time, it is a handy tool for troubleshooting many such driver initialization problems.

To save memory when loading drivers, you can execute DRVLOAD using the DOS 5.0 (and later) LH or LOADHIGH command. This will install the driver in the upper memory blocks (UMBs); that is, in the extended memory mapped within the top 384K address space of the first megabyte of RAM. The driver will then be loaded just as it would be if DEVICEHIGH were specified in CONFIG.SYS. This reduces the amount of base memory consumed by resident programs such as device drivers.

There is one potential danger to load-

ing device drivers in upper memory blocks, however. A driver loaded in a UMB has a limited amount of RAM available, especially when other programs are already loaded there. DRVLOAD itself tells the driver how much memory is available, but some drivers ignore this information and simply assume they can use as much memory as they need. DRVLOAD attempts to handle this situation by checking the size of the driver file and reporting an error if this size exceeds available memory.

This precaution, though usually sufficient, is not entirely foolproof, since drivers may claim additional memory for buffer space or other work areas. If you experience difficulty when trying to use LOADHIGH with DRVLOAD, you may wish to load the driver without the LH parameter and then scan the output of the DOS 5 MEM/C command, looking for all the blocks of memory belonging to the particular driver. Better yet, the MEM/M drvname command in DOS 6.0 will show you all the blocks used by a par-

Top 10 DOS Utilities

Rank	Utility
1	DIRMATCH - Compares directories
2	BAT2EXEC - Compiles batch files
3	DEFRAGR - Defragments disks
4	CHKFRAG - Checks fragmentation
5	PCSPPOOL - Print spooler
6	STRINGS - Batch file enhancer
7	PCUNZIP - Unzips files
8	PCREM2 - Remotely operates computer
9	CDX - Changes directories
10	BOOT2C - Forces hard disk boot

This list is based on the total number of downloads each utility has had on PC MagNet over the past 12 months. To download these files, type GO ZNT:TIPS. For more information, see the sidebar "How to get PC Magazine's Utilities."

Device Driver Header

Field	Size	Offset
Link to next driver	dword	0
Attribute	word	4
Offset of strategy	word	6
Offset of interrupt	word	8
Device Name (character drivers)	8 bytes	0ah
Number of Units (block drivers)	1 byte	0ah

Also, for a CD-ROM device:

Reserved (must be 0)	word	12h
Drive letter	byte	14h
Number of units	byte	15h
Signature ("MSCDnn")	6 bytes	16h

Figure 1: MS-DOS device driver headers conform to this format.

ticular driver. (For *drvname*, you use the name portion of the driver only, without extension.) After learning how much space the driver needs, the simple MEM report of DOS 5.0 or 6.0 will determine whether there's room to load the driver in upper memory.

Since DRVLOAD is executed from the DOS prompt, you should not use it to install drivers that must be present as part of the boot process. For example, EMM386 and HIMEM, which are needed during booting to load DOS high, should not be executed with DRVLOAD.

WHY NO UNINSTALL? You might think that one good reason for loading device drivers from the DOS prompt instead of through CONFIG.SYS would be to let you uninstall them later. Unfortunately, however, device drivers don't lend themselves to such treatment.

Like TSR programs, device drivers typically install interrupt handlers for communicating with hardware devices. But while utilities such as MARK/RELEASE and *PC Magazine's* own INSTALL/REMOVE can restore the original interrupt vector contents and de-allocate the memory used by resident programs without crashing the system, DRVLOAD alters a number of internal DOS data areas in the course of creating an appropriate context for the device drivers it loads. To restore not only the interrupts, but the whole previous context when a driver was uninstalled would be a complex task—a task that would become even more complex as subsequent drivers were added via DRVLOAD.

Because of similar considerations, you cannot use DRVLOAD in a Windows DOS box. When you exit the DOS box, Windows automatically undoes any changes a program has made to the hardware interrupts, but since Windows does not expect the kind of low-level DOS data structure manipulation performed by DRVLOAD, using

the utility in a DOS box could spell trouble. DRVLOAD simply refuses to execute under Windows.

In the end, then, I judged that the convenience of being able to uninstall (at best) the device driver last loaded by DRVLOAD was not worth the risk of making the utility crash-prone. I have not provided a means of uninstalling device drivers within DRVLOAD, therefore, nor should you ever use INSTALL/REMOVE or any other TSR-uninstalling utilities in conjunction with the DRVLOAD utility. (MARK/RELEASE is apparently smart enough to

detect that it shouldn't try to unload a device driver, but many other such utilities are not.)

OTHER CAVEATS If, when installing a device driver with DRVLOAD, you get an error message that there aren't enough drive letters available, it simply means that one line in CONFIG.SYS will have to be changed. By default, DOS accommodates as many block devices as there are *actual* drives on the system, with a minimum of five, which are referenced as drives A: through E:. More drives can be added by putting an appropriate LASTDRIVE= statement in CONFIG.SYS. For example, if your system has five or fewer actual drives, LASTDRIVE=G (note that the usual drive-denoting colon is not used in this statement) would make room for two additional block devices, drives F: and G:. You will have to reboot when you've added or changed the LASTDRIVE statement, of course, but thereafter you'll be able to use DRVLOAD to load block devices from the command line without incident.

INSIDE DRVLOAD Having seen how to use DRVLOAD, you may wish to examine some of its inner workings. Since DRVLOAD must mimic the processing that DOS performs when initializing a device driver, a review of MS-DOS de-

The Command Request Block

Field	Size	Offset
Values passed to driver:		
Command code (0 for INIT)	byte	2
End of available driver memory (DOS 5+)	dword	0eh
Pointer to command line (first character after "device=")	dword	12h
First available drive number (DOS 3+)	byte	16h
Values returned by driver:		
Return status	word	3
Number of units (block drivers only)	byte	0dh
End of resident code (driver break address)	dword	0eh
Pointer to BPB pointer array (block drivers only)	dword	12h
Message flag (DOS 5+) (indicates if DOS should display message if INIT fails)	word	17h

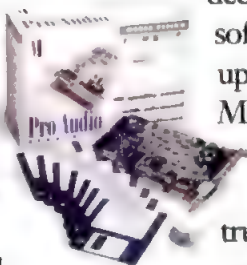
Figure 2: The table above shows the values passed to and received from the device driver via the initialization command request block.

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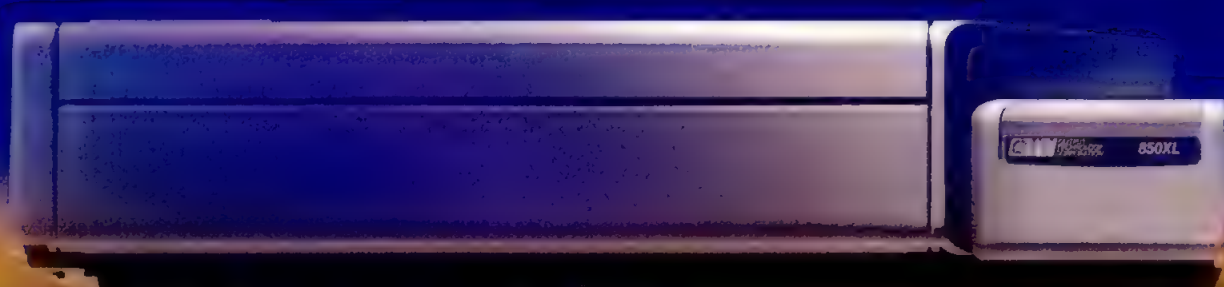


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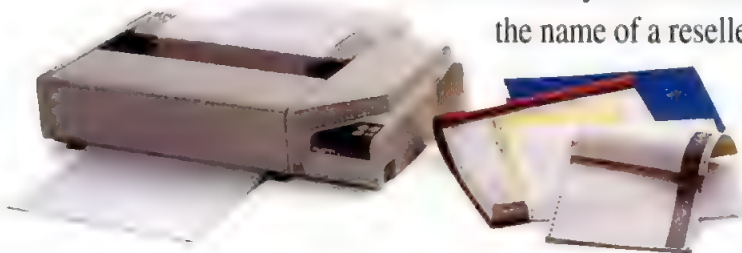


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do_drv_init

Complete Listing

```

;do_drv_init - Format an INIT cmd blk and call the driver
;               strategy and interrupt routines.
;
;   Enter:
;       ds=local data segment
;       es:bx=ptr to driver header
;       driver_p_off=offset of any cmd line parms
;           (these are preceded by driver
;            file name in driver_file)
;       al=number of block devices on system
;
;   Exit:
;       ax=number of paragraphs to keep
;       es:bx=ptr to driver header
;       NZ=if INIT failed.
;
;   ds saved
;-----
do_drv_init    proc    near
    push    ds                ;save driver header ptr
    push    es
    push    bx
    mov     si, bx            ;offset of driver
    mov     bx, driver_p_off
    mov     byte ptr [bx-1], ' ' ;file spec was ASCIIZ
    mov     dx, offset driver_file ;offset of cmd line
    mov     bx, offset init_cmd_blk ;point to cmd block
    mov     [bx].rh_len, (size init_req) ;len cmd blk
    mov     [bx].init_bpb_tbs, dx ;offset cmd line
    mov     [bx].init_drv_first, al ;next available drive
    mov     [bx].init_bpb_tbs, cs ;seg for cmd line
    mov     [bx].init_brk_seg, cs ;end of avail mem

    mov     ax, ds
    mov     dx, es
    assume  ds:nothing
    mov     ds, dx
    mov     es, ax

;es:bx point to driver cmd request block
    push    cs                ;far

    mov     ax, offset do_drv_i100 ;return address
    push    ax
    push    ds                ;far "call"
    push    word ptr [si].dev_stratr ;address
    retf                                ;make strategy call

do_drv_i100:
    push    cs                ;far
    mov     ax, offset do_drv_i200 ;return address
    push    ax

    push    ds                ;far "call"
    push    word ptr [si].dev_intr  ;address
    retf                                ;make int call

do_drv_i200:
    test    es:[bx].rh_status, (mask err_bit) ;error?
    jnz     do_drv_i900
    mov     dx, ds            ;start of driver
    mov     ax, es:[bx].init_brk_seg
    sub     ax, dx            ;difference if any
    mov     dx, es:[bx].init_brk_ofs
    add     dx, 0fh           ;paragraph round
    mov     cl, 4
    shr     dx, cl            ;convert to paragraphs
    add     ax, dx            ;total paragraphs
    sub     cl, cl            ;zero flag set
    assume  ds:code

do_drv_i900:
    pop     bx
    pop     es                ;driver header seg
    pop     di
    ret

do_drv_init    endp

```



Figure 3: The routine above is used to issue the initialization command to a device driver.

vice driver architecture may provide a helpful starting point.

MS-DOS device drivers come in two flavors: character and block. Character device drivers control peripherals such as modems, keyboards, and printers, which handle I/O 1 byte (character) at a time. These devices are referenced within the system by device names such as COM1, CON, and PRN, and they can be treated in some respects as if they were *files*, as in the command COPY FOO PRN. Block device drivers control such devices as floppy and hard disks, which perform I/O operations on whole chunks (that is, sectors) of data at once. Block devices are referenced by drive letters, such as A: or C:. For further information about MS-DOS device drivers, I recommend Robert S. Lai and The Waite Group's *Writing MS-DOS Device Drivers* (Addison-Wesley; 1987, 1992). Other useful sources are Ray Duncan's *Advanced MS-DOS* (Microsoft Press; 1986, 1988), and Andrew Schulman and others', *Undocumented DOS* (Addison-Wesley, 1990).

The format for the first portion, or

header, of a DOS device driver is shown in Figure 1. The header tells DOS both the type of device being controlled and the location within the driver of the strategy and interrupt routines. The former is specified by bits in the attribute field. The latter are the routines that DOS calls

BIOS Parameter Blocks

let DOS know about the important aspects of the disk.

when it sends commands to the driver. Further header information includes either the device name (for character devices), or the number of units (drives) supported (for block devices).

DOS performs two steps when it sends commands to device drivers. First it sets the ES:BX register pair to point to a command request block and calls the device driver strategy routine. This portion of

the driver simply stores the ES:BX pointer and returns. Then DOS calls the driver's interrupt routine, which retrieves the saved command request block pointer and processes the command.

Figure 2 shows the layout for the INIT command, which is the first command sent to a device driver. Several values within the INIT command block are filled in by the interrupt routine. The break address field indicates the last memory location within the driver that is to be retained in memory after initialization. For block devices, the BPB (BIOS Parameter Block) field points to a table that contains offsets to the BPB for each unit supported by the device driver. BPBs let DOS know about the important aspects of the disk; for example, the sector size, total number of sectors, number of root directory entries, and so on.

Given this information, the tasks of DRVLOAD seem clear: read the driver into memory, send it an INIT command, calculate the amount of memory used by the driver (returned in the break address), let DOS know there's a new driver

on the system, and make the driver area terminate and stay resident. Each of these areas deserves further comment.

LOADING AND LOCATING When DOS loads a .COM program, it allocates all available memory to that program. A field in the Program Segment Prefix (PSP) identifies the end of the memory block allocated to the program, which is thus the top of available memory. To preserve the maximum amount of free contiguous memory, before it loads the specified device driver, DRVLOAD relocates the loader portion of its own code just below this point. At the same time, DRVLOAD discards the portions of its own

code (the code used for parsing the command line, verifying DOS version, and so on) that are no longer needed.

Next, DOS function 430Bh (load overlay) is used to retrieve the specified device driver from disk and to load it just after DRVLOAD's original PSP area. The load overlay function is used instead of reading the file into memory because some device drivers are in .EXE formats and the load overlay function resolves all .EXE header items. (For more information on the PSP and .EXE formats, see the *MS-DOS Programmer's Reference: Version 5.0*, Microsoft Press, 1991.)

After performing a little sanity check-

ing on the device driver header (the user may have specified a nondevice driver filename on the DRVLOAD command line, for example), DRVLOAD formats an INIT command request block and calls the device driver strategy and interrupt routines. The code for this process is listed in Figure 3.

If the INIT command fails, the status field in the command request block is returned with the high bit set, indicating an error. In that case, DRVLOAD displays an error message and exits to DOS. If initialization is successful, DRVLOAD must patch the device driver into the DOS device driver chain. Therefore a

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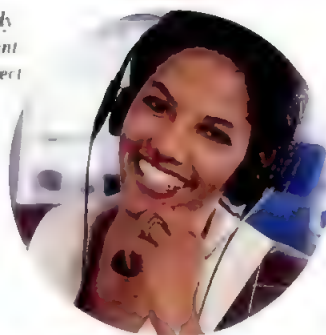
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;Also, update number of block devices field in
;the DOS list of lists.
;
;Enter:
;ds=local data segment
;cds_ptr=ptr to next available CDS entry
;cds_size=size of each CDS entry
;dpb_ptr=ptr to first DPB entry
;dpb_size=size of each DPB entry
;last_drive=max number of CDS entries
;es:bx=ptr to driver header
;dpb_link_off=offset of link to next device driver
;dpb_drv_off=offset of address of device driver
;in DPB entry
;max_avail_units=maximum number of drive letters
;available for drives
;
;Exit:
;CY=reset if for some reason, DOS data
;areas corrupted, etc. (this should
;never happen)
;
;mem_to_keep=adjusted to add in DPBs placed
;at end of driver (break address)
;
;ds, es, bx preserved
;-----
make_drives proc near
push bx
push ds
push es

;dpb_size contains DOS version specific size of DPB entry. Convert
;this to paragraphs --used to determine the number of additional
;paragraphs we need to keep resident.
;
mov ax, dpb_size ;size each DPB
add ax, 0fh ;round up
mov cl, 4
shr ax, cl
mov dpb_para, ax

sub ch, ch
mov cl, es:[bx].dev_num_units ;number of units
cmp cl, max_avail_units ;enough drive letters?
jbe make_dr050
mov ah, 9
mov dx, offset units_msg ;let user know that
int 21h ;we can't do all of them
mov cl, max_avail_units ;only do what we can

make_dr050:
call get_last_dpb ;find last DPB
jc make_dr999 ;exit if error

;dx:si holds ptr to DPB for previous drive. Save the pointer.
;
mov prev_dpb_ptr.d_segment, dx
mov prev_dpb_ptr.d_offset, si

;Save device driver header address
;
mov cs:drv_head_offset, bx ;save drv header
mov dx, es

;get pointer to BPB table
lda bx, dword ptr cs:init_cmd_blk.init_bpb_tbo

mov al, cs:init_cmd_blk.init_drv_first ;drive
sub ah, ah ;unit counter

make_dr100:
push ax ;save unit count/drive #
mov ax, dx ;base of driver
add ax, cs:mem_to_keep ;set for DPB
mov es, ax

;Clear the area where DPB will reside. BPB to DPB function doesn't
;initialize all of the fields. This ensures that the drive access
;field is clear initially.
;
;
push cx ;save unit count
mov cx, cs:dpb_size ;clear the DPB area
xor al, al
xor di, di
rep stosb
pop cx

```

```

xor bp, bp ;es:bp ptr to new DPB
mov si, [bx] ;get BPB offset

;Use undocumented DOS call to translate BPB to DPB
;
mov ah, DOS_XLAT_BPB
int 21h
xor di, di
pop ax ;count/drive #
push ax ;save again
mov es:[di], ax ;put into DPB

;Put address of device driver into DPB. Offset for this DPB entry
;is DOS version specific.
;
push bx
mov bx, cs:dpb_drv_off
mov es:[di + bx].d_segment, dx ;device driver

mov ax, cs:drv_head_offset
mov es:[di + bx].d_offset, ax

mov bx, cs:dpb_link_off
mov bp, bx ;save link offset

;Link to next DPB
;
mov ax, 0ffffh ;mark this as last DPB

mov es:[di + bx].d_segment, ax
mov es:[di + bx].d_offset, ax

pop bx

inc bx ;next BPB table entry
inc bx

call fill_cds

;Link previous DPB to this one
;
mov ax, es ;DPB segment
mov si, di ;DPB offset

les di, cs:prev_dpb_ptr ;previous DPB
add di, bp ;link offset in DPB

mov es:[di].d_segment, ax
mov es:[di].d_offset, si

;Save pointer to DPB just created (in case more than one unit
;is supported, it can be linked to the next DPB created).
;
mov cs:prev_dpb_ptr.d_segment, ax
mov cs:prev_dpb_ptr.d_offset, si

mov ax, cs:dpb_para ;# paragraphs DPB uses
add cs:mem_to_keep, ax ;add to total to keep

pop ax ;save unit count/drive #
inc ah ;unit counter
inc al ;drive counter

loop make_dr100

push ax ;save unit count
mov ah, DOS_LIST_LISTS ;get list of lists ptr
int 21h ;restore it
pop ax

;Increase the number of block devices variable kept in the DOS
;list of lists.
;
mov si, cs:num_blk_off ;offset for # drives
mov al, cs:num_blk_devices ;original number
add al, ah
mov es:[bx + si], al

clc ;success

make_dr999:

pop es
pop ds
pop bx
ret

make_drives endp

```

Figure 4: The code above supports altering system areas in order to add block devices.

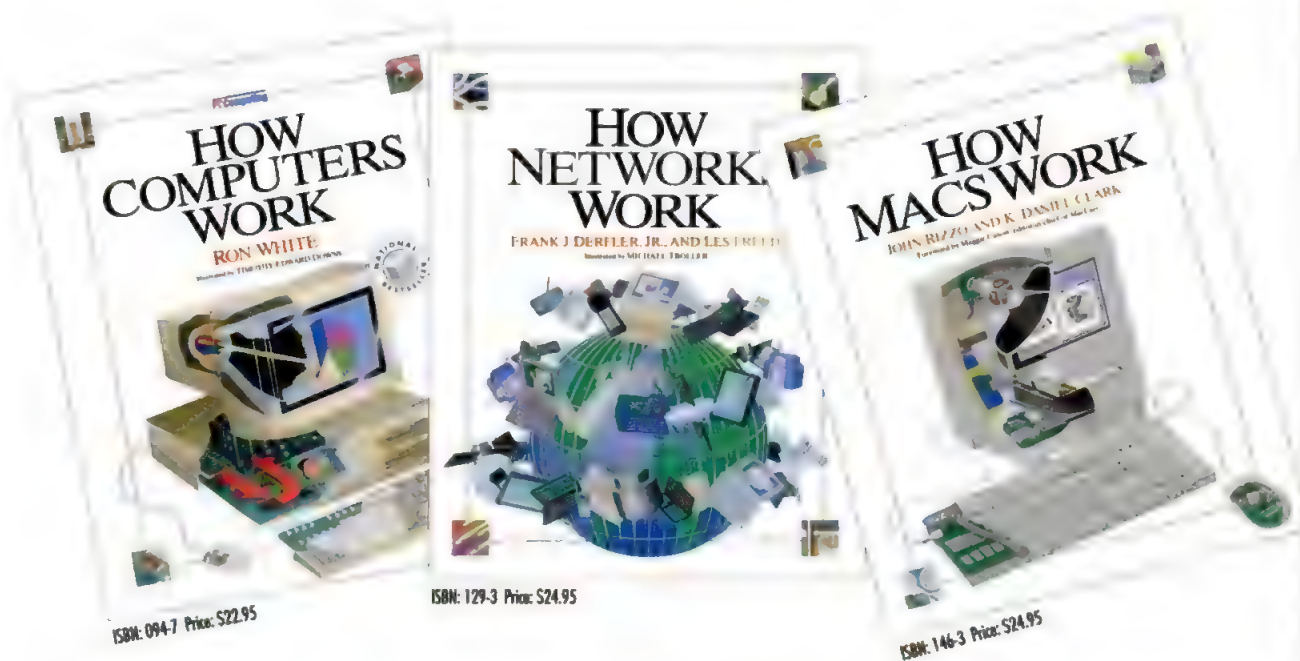


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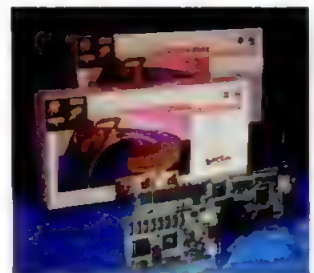
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CIRCLE 124 ON READER SERVICE CARD

pointer to this chain is retrieved, using the undocumented DOS "list-of-lists" function, 52h. Part of the information returned by this function is a pointer to the NUL device driver header, which marks the beginning of the driver chain. (DRVLOAD also saves several other items that are returned from this function and that will become important later.)

Like DOS, DRVLOAD adds new device drivers to the driver chain by inserting them in the chain just after the NUL device. That is, the driver chain link address in the NUL device header is replaced with the address of the driver being installed, and the link field in the driver's header is then updated with the original contents of the NUL device header's link field. (For an in-depth discussion of function 52h and many of the other techniques used in DRVLOAD, see Schulman's *Undocumented DOS*, mentioned above.)

CHARACTER AND BLOCK DEVICES Once the driver has been loaded and linked into the DOS chain, the next step depends on the type of driver being installed. DRVLOAD calculates the size of the device driver in paragraphs and stores this information in the variable `mem_to_keep`. For character device drivers, it then passes the size to the DOS TSR (terminate and stay resident) function, 31h. Since the driver is loaded at the beginning of the memory allocated to DRVLOAD, this effectively terminates the utility and leaves the driver resident.

For block device drivers, there's more work to be done, since DOS must be convinced that another drive is present on the system. To accomplish this, DRVLOAD must again call upon undocumented DOS features, this time to manipulate the DPBs (Drive Parameter Blocks) and CDSs (Current Directory Structures). The code that performs these tasks is listed in Figure 4.

DOS maintains a DPB entry for each physical drive on the system. As shown in Figure 5, this entry houses not only the BIOS Parameter Block data, but also other information, including the address of the device driver responsible for controlling the drive. DRVLOAD must create a DPB entry for each drive unit handled by the device driver.

Creating the DPB entry requires sev-

QUICK REFERENCE CARD

DRVLOAD



Rick Knoblaugh

November 9, 1993 (Utilities)

Purpose: Installs MS-DOS device drivers from the DOS command prompt, eliminating the need to edit the CONFIG.SYS file to include device= statements and then reboot.

Format: [LH] DRVLOAD [d:][path]filename
[driver_parameters]

Remarks: The DRVLOAD utility can be executed directly from the command prompt of DOS 3.0 or later; it cannot be run from the DOS box of Windows, however. The utility requires approximately 2K of storage space, and it adds approximately 256 bytes to the size requirement of the drivers it loads.

When executed under DOS 5.0 or later, preceding DRVLOAD with the LH (LOADHIGH) command causes the utility to be loaded into upper memory blocks, thus saving space in conventional memory. If insufficient UMB memory is available for the driver file size, DRVLOAD reports the error. Drivers that claim additional memory when loaded, however, may fail to load properly with LH if their memory demand exceeds that available. Loading the driver in conventional memory and using the MEM /C (DOS 5) or MEM /M (DOS 6) commands will indicate the actual driver requirement.

Although intended primarily for occasionally loading infrequently used drivers (such as for RAM disks or CD-ROMs), DRVLOAD can be used as part of a batch file to load drivers conditionally. It is also useful in debugging, where conventional loading would execute the driver code before a debugger could be loaded.

DRVLOAD cannot be used to install those drivers (such as EMM386 and HIMEM) that must be present during the boot process. Further, no attempt should be made to use utilities such as MARK/RELEASE or PC Magazine's INSTALL/REMOVE to uninstall drivers loaded with DRVLOAD.

Both the executable FINDIRQ.COM and its assembly-language source files can be downloaded from PC MagNet. A Microsoft MASM assembler (or compatible), LINK and EXE2BIN are required if the program must be reassembled.

eral steps. First, using a pointer to the DPB chain (retrieved from the "list-of-lists" function), DRVLOAD locates the end of the chain and adds a new DPB to it. To generate the DPB information for the entry, DRVLOAD then uses the undocumented DOS function 53h: Translate BPB to DPB. DRVLOAD calls this function for each unit controlled by the device driver.

A pointer to each unit's BPB (gained from the pointer to the table returned in the INIT call) and a pointer to a data area to be filled with the DPB information are passed to the translate function. DRVLOAD positions each DPB in memory just after the end of the code used by the device driver (its "break address"). The number of memory paragraphs used by each DBP is added to the variable mem_to_keep, which specifies how much memory will remain resident.

Care must be taken when using the Translate BPB to DPB function. Since it is used internally by DOS, the function includes no error-checking precautions against being passed invalid BPB information, such as zeros for the number of sectors or sectors per cluster fields. Although

The Current Directory Structure			
Field	Size	DOS 3 Offset	DOS 4+ Offset
ASCIIZ string of current path	67 bytes	0	0
Bit flags	word	43h	43h
Pointer to DPB	dword	45h	45h
First cluster of current working directory (nonnetwork)	word	49h	49h
Pointer to a redirector record (network)	dword	49h	49h
Unknown (always 0ffffffh) (nonnetwork)	dword	4bh	4bh
Stored parameter from INT 21 AX=5F03h (network)	word	4dh	4dh
Offset of \ in current path for root directory	word	4fh	4fh
Unknown	byte	N/A	51h
Pointer to IFS driver	dword	N/A	52h
Unknown	word	N/A	56h

Figure 6: DRVLOAD fills in the Current Directory Structure for each new drive created.

drivers should normally never generate incorrect BPB data, DRVLOAD inspects these values prior to calling the function, thus avoiding a potential system hangup.

With the DPB entries created, the next step is to fill in the CDS entry for each drive. As its name implies, the Cur-

rent Directory Structure contains the current directory on the drive. In addition, it has a status bit flags field that indicates whether the drive is a network or physical drive, or whether it is a logical drive that results from a JOIN or SUBST command. (The CDS is where SUBST and JOIN actually do their work.) These fields also indicate whether the drive is an Installable File System (both set) or an invalid drive (neither set). The format of the CDS is shown in Figure 6. Since each CDS entry's current working directory string is prefilled by DOS with the root directory for that drive, DRVLOAD simply initializes the other fields, including the pointer to the DPB.

The last step in making DOS aware of the existence of the added drive(s) is to update the "list-of-lists" field that contains the number of block devices. DRVLOAD adds the number of units supported by the device driver to the previous value. This completes the additional installation processing required for block device drivers.

Next time you wish you'd loaded a given device driver, don't even think about editing CONFIG.SYS and rebooting. Instead, install it from the DOS prompt without all that hassle, using DRVLOAD. □

RICK KNOBLAUGH IS A FREQUENT CONTRIBUTOR TO PC MAGAZINE.

The Drive Parameter Block

Field	Size	DOS 3 Offset	DOS 4+ Offset
Driver Number (A = 0)	byte	0	0
Unit number within driver	byte	1	1
Sector size	word	2	2
Sectors per cluster - 1	byte	4	4
Sectors/cluster in log base 2	byte	5	5
Number of reserved (boot) sectors	word	6	6
Number of copies of FAT	byte	8	8
Number of root directory entries	word	9	9
First data sector	word	0bh	0bh
Number of clusters + 1	word	0dh	0dh
Number of FAT sectors	byte	0fh	N/A
Number of FAT sectors (DOS 4+)	word	N/A	0fh
First sector of root directory	word	10h	11h
Address of device driver	dword	12h	13h
Media descriptor	byte	16h	17h
Indicates access to drive —a value of 00 means block accessed —a value of 0FFh means block must be rebuilt	byte	17h	18h
Address of next DPB	dword	18h	19h
Cluster at which to start ; search for free space when writing	word	1ch	1dh
Number of free clusters	word	1eh	1fh

Figure 5: DRVLOAD creates a DPB entry with this structure for each drive unit controlled by the device driver. (The field descriptions are from Andrew Schulman's *Undocumented DOS*.)



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Unicode, Wide Characters, and C

BY CHARLES PETZOLD

People who write about computers in more general interest magazines often avoid using the word *byte*, instead describing storage capabilities in terms of *characters*. That's a pretty simple conversion, because one character of text requires 1 byte of storage. Right?

Wrong! When dealing with ASCII character sets, the equivalence is certainly correct. But ASCII character sets (even when extended by another 128 codes) are unable to represent anything beyond the Latin alphabet and some accented letters used in European alphabets. Several makeshift solutions exist, such as non-Latin fonts and double-byte character sets (DBCS). In a DBCS, some characters require 1 byte and some require 2; those requiring 2 bytes are used for Far Eastern languages.

A far better solution for international computing is to replace ASCII with a uniform 2-byte character encoding. As I discussed in the last issue, the system that shows the most promise of becoming a standard is Unicode. Unicode was developed by a consortium of big names in the computer industry and is supported by Windows NT. Its first 128 codes are the same as ASCII, but it is capable of representing all the characters of all the written languages of the world. It may even come to pass someday that journalists who write about computers in general-interest magazines will have to adjust their convenient equivalence of bytes and characters. (Presumably they can divide by 2!)

When Unicode text is stored in memory or files, character strings are represented as a series of 16-bit values rather than as bytes. The first time I encountered this concept, I got the shivers. How on earth do you use your favorite pro-

gramming language with Unicode? Luckily, other people have considered that problem, and support for "wide characters" (as they are called) is part of the ANSI C standard. That's what I'll examine in this issue.

EIGHT-BIT CHARACTERS We all know how to store characters and character strings in our C programs. You simply use the `char` data type. But to facilitate an understanding of how C handles wide char-

*How on earth can you use
your favorite programming
language with Unicode?
Here we'll find out
by examining the mechanics
of programming wide
characters in C.*

acters, let's first review normal character definition.

The following statement defines and initializes a variable containing a single character:

```
char c = 'A' ;
```

The variable `c` requires 1 byte of storage containing the value 65 (the hexadecimal value 0x41), which is the ASCII code for the letter A.

You can define a pointer to a character string like so:

```
char * p ;
```

Windows NT, being a 32-bit operating system, reserves 4 bytes of storage for the

character pointer. You can also initialize a pointer to a character string:

```
char * p = "Hello!" ;
```

In this case, the variable `p` requires 4 bytes of storage, and the character string is stored in static memory using 7 bytes of storage—the 6 bytes of the string plus a terminating zero.

You can also define an array of characters, like this:

```
char a[10] ;
```

In this case, the compiler reserves 10 bytes of storage for the array. If the array variable is global (outside any function), you can initialize it with

```
char a[] = "Hello!" ;
```

If you define this array as a local variable to a function, it must be defined as a static variable, as follows:

```
static char a[] = "Hello!" ;
```

In either case, the string is stored in static program memory with a zero appended at the end, thus requiring 7 bytes of storage.

LET'S GET WIDER The `char` data type continues to be a single-byte value in C. To use 16-bit wide characters in a C program, you must include the `WCHAR.H` (wide character) header file in your program:

```
#include <WCHAR.H>
```

This header file contains definitions of new data types, structures, and functions for using wide characters. In particular, `WCHAR.H` defines the new data type `wchar_t` as

UNITEST1.MAK

Complete Listing

```

#-----
# UNTEST1.MAK make file
#-----

!include <ntwin32.mak>

unittest1.exe : unittest1.obj
    $(link) $(conflags) -out:unittest1.exe unittest1.obj $(conlibs)

unittest1.obj : unittest1.c
    $(cc) $(cflags) $(cvars) unittest1.c

```



Figure 1: This make file facilitates compilation and linking of the UNTEST1 program.

```
typedef unsigned short wchar_t ;
```

pointer to a wide character string:

```
wchar_t * p = L"Hello!"
```

Although the int data type has grown from 16 bits to 32 bits under the Windows NT C compiler, the short data type is still a 16-bit value. Thus, the wchar_t data type is the same as an unsigned short integer.

To define a variable containing a single wide character, you use the following statement:

```
wchar_t c = 'A' ;
```

The variable *c* is the two-byte value 0x0041, the Unicode representation of the letter A. (However, given the Intel protocol of storing least-significant bytes first, the bytes are actually stored in memory in the sequence 0x41, 0x00. Keep this fact in mind as we examine the output of a sample program shortly.)

You can also define and initialize a

Notice the *L* (for *long*) directly preceding the first quotation mark. This indicates to the compiler that the string is to be stored with wide characters, that is, with every character occupying 2 bytes. The variable *p* requires 4 bytes of storage, as usual, but the character string requires 14 bytes—2 bytes for each character with two bytes of zeros at the end.

Similarly, you can define an array of wide characters this way:

```
wchar_t a[] = L"Hello!" ;
```

The string again requires 14 bytes of storage.

Although it looks rather ugly and unnatural, that *L* preceding the first quotation mark is very important, and there

must not be a space between the two symbols. Only with that *L* will the compiler know you want the string to be stored with 2 bytes per character. Later on, when we look at wide character strings in places other than variable definitions, you'll encounter the *L* preceding the first quotation mark again. Fortunately, the C compiler will often give you an error message if you forget to include the *L*.

LET'S TRY IT OUT If the concept of wide character strings is new to you, you're definitely not alone, and you may be skeptical that this can really work. So let's try it out. The UNTEST1 program is shown in Figures 1 and 2.

To compile and run this program, you'll need Windows NT 3.1 and the Microsoft Win32 Software Development Kit installed. You can compile and link the program using the command line

```
NMAKE UNTEST1.MAK
```

Notice that the UNTEST1.C program includes the WCHAR.H header file at the beginning. The program defines two character strings (the text "Hello, world!"), one using the char data type and the other using wchar_t. The two variable names for these character strings are acString (the ASCII version) and wcString (the wide-character version). UNTEST1 then uses the printf function to display each string, determine its storage size, determine the number of characters using the strlen function, and

UNITEST1.C

Complete Listing

```

/*-----
UNTEST1.C -- Unicode Test Program #1
(c) Charles Petzold, 1993
-----*/

#include <wchar.h>
#include <stdio.h>
#include <string.h>

int main (void)
{
    int i ;
    char acString [] = "Hello, world!" ;
    wchar_t wcString [] = L"Hello, world!" ;

    printf ("The acString array is %s\n", acString) ;
    printf ("The string occupies %d bytes\n", sizeof (acString)) ;
    printf ("The string is %d characters long\n", strlen (acString)) ;

    printf ("The string begins: " ) ;

    for (i = 0 ; i < 5 ; i++)
        printf ("%c ", acString [i]) ;

    printf ("\n") ;

    printf ("The string begins: " ) ;

    for (i = 0 ; i < 5 ; i++)
        printf ("%02X ", acString [i]) ;

    printf ("\n") ;

    printf ("The wcString array is %s\n", wcString) ;
    printf ("The string occupies %d bytes\n", sizeof (wcString)) ;
    printf ("The string is %d characters long\n", strlen (wcString)) ;

    printf ("The string begins: " ) ;

    for (i = 0 ; i < 5 ; i++)
        printf ("%c ", wcString [i]) ;

    printf ("\n") ;

    printf ("The string begins: " ) ;

    for (i = 0 ; i < 5 ; i++)
        printf ("%04X ", wcString [i]) ;

    return 0 ;
}

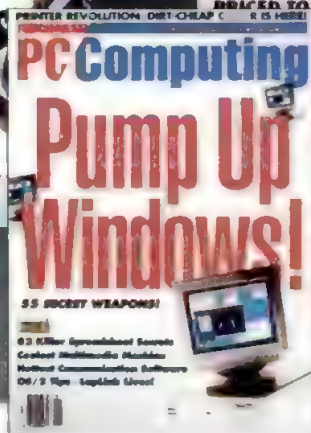
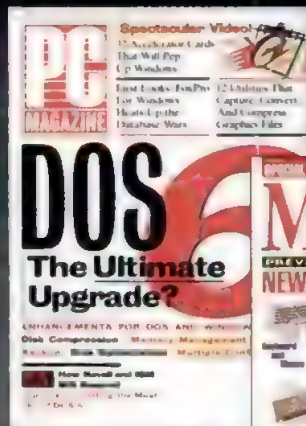
```



Figure 2: The UNTEST1 program tests wide character support but doesn't quite succeed.

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UNITEST1's Output

```
The acString array is Hello, world!
The string occupies 14 bytes
The string is 13 characters long
The string begins: H e l l o
The string begins: 48 65 6C 6C 6F

The wcString array is H
The string occupies 28 bytes
The string is 1 characters long
The string begins: H e l l o
The string begins: 0048 0065 006C 006C 006F
```

Figure 3: This is the result of running the UNITEST1 program; as you can see, there are some problems.

then display the first five characters in both character and hexadecimal format.

The first thing you'll notice when compiling the program is a warning message reading (in part) "incompatible types - from 'unsigned short[14]' to 'const char*.'" This message results from passing the wcString variable to the strlen function, which expects a pointer to a character string but gets instead a pointer to a string of short integers. It's only a warning message, so the compilation will continue and you can run the program. The results are shown in Figure 3.

The top half of the output looks fine, exactly as we expected. But what happened with the wide character string? First, printf simply displays the string as 'H. Why is this? Well, printf expected a string of single-byte characters terminated by a zero byte. The first character has a 16-bit hexadecimal representation of 0x0048. But these bytes are stored in memory in the sequence 0x48, 0x00. The printf function thus assumed that the string was only one character long. Similarly, the strlen function reported that the string was only a single character.

Everything else seems to work. In particular, the sizeof operator reported that the ASCII string required 14 bytes of storage, and the wide character string required 28 bytes of storage. Also, indexing the wchar_t array correctly retrieves each character of the string for printf to display.

This program clearly illustrates the differences between the C language itself and the runtime library functions. The compiler interprets the string L"Hello, world!" as a collection of 16-bit short integers and stores them in the wchar_t array. The compiler also handles the array indexing and the sizeof operator cor-

rectly. But the runtime library functions strlen and printf are added during link time. These functions expect strings comprised of single-byte characters. When confronted with wide character strings, they don't perform as we'd like.

THE WCHAR LIBRARY FUNCTIONS The solution is alternate runtime library functions that accept wide character strings

*The character length of a
string does not change
when you move to wide
characters—only the byte
length changes.*

rather than single-byte character strings. Fortunately, such functions exist in Microsoft's 32-bit C compiler package, and they're all defined in WCHAR.H.

For example, the wide-character version of the strlen function is called wcslen (wide character string length); the wide-character version of the printf function is called wprintf. Let's put these two functions to use in the UNITEST2 program

shown in Figures 4 and 5. Notice that in the second part of the UNITEST2 program, the strlen program has been replaced with wcslen, and all the printf functions have been replaced with wprintf (although only one of them gave us trouble in UNITEST1).

The only other code change is that a capital L now precedes the formatting string in the wprintf functions. From personal experience, I guarantee you'll frequently forget to include the L when you first start working with wide character strings. When you use the wide character functions defined in WCHAR.H, every string you pass to them must be composed of wide characters.

The output of UNITEST2 is shown in Figure 6. This is what we want. Although the size of the wide character string is 28 bytes (the 13 wide characters plus the terminating 16-bit zero), the wcslen function reports 13 characters. Keep in mind that the character length of a string does not change when you move to wide characters—only the byte length changes. And as I explained earlier, a byte is not necessarily a character.

BUT WHAT'S THE POINT? Of course we haven't yet established any real benefit to using Unicode in these two programs. We're still displaying pure ASCII text in character mode. The character mode font in the U.S. version of Windows NT isn't capable of displaying the extra Unicode characters. If such characters appeared in a string, they'd simply be ignored upon display. (You can test this by inserting, for example, the character \x0413 into the wcString array. This is the character code for a letter in the Cyrillic alphabet.)

Of course, where Unicode is most important is in graphical Windows NT programs. Indeed, the retail release of Win-

UNITEST2.MAK

Complete Listing

```
#-----
# UNITEST2.MAK make file
#-----

!include <ntwin32.mak>

unittest2.exe : unittest2.obj
    $(link) $(conflags) -out:unittest2.exe unittest2.obj $(conlibs)

unittest2.obj : unittest2.c
    $(cc) $(cflags) $(cvars) unittest2.c
```

Figure 4: UNITEST2.MAK facilitates compilation and linking of the UNITEST2 program.



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UNITEST2.C

Complete Listing

```

/*-----
  UNITEST2.C -- Unicode Test Program #2
  (c) Charles Petzold, 1993
  -----*/

#include <wchar.h>
#include <stdio.h>
#include <string.h>

int main (void)
{
    int    i ;
    char   acString [] = "Hello, world!" ;
    wchar_t wcString [] = L"Hello, world!" ;

    printf ("The acString array is %s\n", acString) ;
    printf ("The string occupies %d bytes\n", sizeof (acString)) ;
    printf ("The string is %d characters long\n", strlen (acString)) ;

    printf ("The string begins: ") ;

    for (i = 0 ; i < 5 ; i++)
        printf ("%c ", acString [i]) ;

    printf ("\n") ;

    printf ("The string begins: ") ;

    for (i = 0 ; i < 5 ; i++)
        printf ("%02X ", acString [i]) ;

    printf ("\n\n") ;

    wprintf (L"The wcString array is %s\n", wcString) ;
    wprintf (L"The string occupies %d bytes\n", sizeof (wcString)) ;
    wprintf (L"The string is %d characters long\n", wcslen (wcString)) ;

    wprintf (L"The string begins: ") ;

    for (i = 0 ; i < 5 ; i++)
        wprintf (L"%c ", wcString [i]) ;

    wprintf (L"\n") ;

    wprintf (L"The string begins: ") ;

    for (i = 0 ; i < 5 ; i++)
        wprintf (L"%04X ", wcString [i]) ;

    return 0 ;
}

```



Figure 5: UNITEST2.C tests wide character support—and gets it right.

dows NT is shipped with a TrueType font containing a small subset of the complete Unicode character set. It's called Lucida Sans Unicode, and it includes additional accented Latin letters; the Greek, Cyrillic, and Hebrew alphabets; and a bunch of symbols. We'll be making good use of this font in future columns when we begin exploring the use of Unicode in graphical programs. For now, we're simply trying to nail down the mechanics of using wide characters in a C program with the C runtime library functions.

MAINTAINING A SINGLE SOURCE There are, of course, certain disadvantages to using Unicode. First and foremost is that every string in your program will occupy twice as much space. In addition, you'll observe that the functions in the wide character runtime library are larger than the usual functions. For this reason, you might want to create two versions of a program—one for a U.S. market that

works strictly with ASCII and another for an international market that uses Unicode. The best solution would be to maintain a single source code file that you could compile for either ASCII or Unicode.

That's a bit of a problem, though, because the runtime library functions have different names, you're defining characters differently, and then there's that nuisance of preceding the string literals with an L.

One answer is to use the TCHAR.H header file supplied with Microsoft's 32-bit C compiler. (My speculation is that the T of TCHAR stands for text.) This header file is not part of the ANSI standard, so every function and macro defined therein is preceded by an underscore. TCHAR.H provides a set of alternative names for the normal runtime library functions requiring string parameters; for example `_tprintf` and `_tcslen`.

If an identifier called `_UNICODE` is defined and the TCHAR.H header file is included in your program, then `_tprintf` is defined to be `wprintf`:

```
#define _tprintf wprintf
```

If not, then `_tprintf` is defined to be `printf`:

```
#define _tprintf printf
```

And so on. TCHAR.H also solves the problem of the two character data types with a new data type named TCHAR. If the `_UNICODE` identifier is defined, then TCHAR is `wchar_t`:

```
typedef wchar_t TCHAR ;
```

Otherwise, TCHAR is simply a `char`:

```
typedef char TCHAR ;
```

Now it's time to address that L problem. If the `_UNICODE` identifier is defined, then a macro called `__T` is defined like this:

```
#define __T(x) L##x
```

That pair of number signs is called a "token paste" and causes the letter L to be appended to the macro parameter. If the `_UNICODE` identifier is not defined, the `__T` macro is simply defined in the following way:

```
#define __T(x) x
```

Regardless, two other macros are defined to be the same as `__T`:

```
#define _T(x)    __T(x)
#define _TEXT(x) __T(x)
```

Which you use will depend on how concise or verbose you would like to be. Basi-

UNITEST2's Output

```

The acString array is Hello, world!
The string occupies 14 bytes
The string is 13 characters long
The string begins: H e l l o
The string begins: 48 65 6C 6C 6F

```

```

The wcString array is Hello, world!
The string occupies 28 bytes
The string is 13 characters long
The string begins: H e l l o
The string begins: 0048 0065 006C 006C 006F

```

Figure 6: Here's the result of running the UNITEST2 program; this time the output is correct.

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UNITESTA.MAK

Complete Listing

```
#-----
# UNTESTA.MAK make file
#-----

!include <ntwin32.mak>

unitesta.exe : unitesta.obj
    $(link) $(conflags) -out:unitesta.exe unitesta.obj $(conlibs)

unitesta.obj : unittest3.c
    $(cc) $(cflags) $(cvars) unittest3.c -Founitesta.obj
```



Figure 7: UNTESTA.MAK facilitates the compilation and linking of the ASCII version of UNTEST3.

UNTESTW.MAK

Complete Listing

```
#-----
# UNTESTW.MAK make file
#-----

!include <ntwin32.mak>

untestw.exe : untestw.obj
    $(link) $(conflags) -out:untestw.exe untestw.obj $(conlibs)

untestw.obj : unittest3.c
    $(cc) $(cflags) $(cvars) -D_UNICODE unittest3.c -Fountestw.obj
```



Figure 8: UNTESTW.MAK facilitates the compilation and linking of the Unicode version of UNTEST3.

UNTEST3.C

Complete Listing

```
/*-----
UNTEST3.C -- Unicode Test Program #3
(c) Charles Petzold, 1993
-----*/

#include <wchar.h>
#include <tchar.h>
#include <stdio.h>
#include <string.h>

int main (void)
{
    int i;
    TCHAR cString [] = _TEXT ("Hello, world!");

    _tprintf (_TEXT ("The cString array is %s\n"), cString);
    _tprintf (_TEXT ("The string occupies %d bytes\n"), sizeof (cString));
    _tprintf (_TEXT ("The string is %d characters long\n"),
        _tcslen (cString));

    _tprintf (_TEXT ("The string begins: "));
    for (i = 0; i < 5; i++)
        _tprintf (_TEXT ("%c "), cString [i]);

    _tprintf (_TEXT ("\n"));

    _tprintf (_TEXT ("The string begins: "));
    for (i = 0; i < 5; i++)
        _tprintf (_TEXT ("%04X "), cString [i]);

    return 0;
}
```



Figure 9: UNTEST3.C is a single source that can be compiled and linked for ASCII or Unicode.

cally, you must define your string literals inside the `_T` or `_TEXT` macro in the following way:

```
_TEXT ("Hello, world!");
```

This causes the string to be interpreted as composed of wide characters if the `_UNICODE` identifier is defined, and as 8-bit characters if not.

Let's test it out with a single source

code module named `UNTEST3.C`. Figures 7 and 8 show two make files, one for creating the ASCII version of the program (`UNTESTA`) and the other for the Unicode version (`UNTESTW`). `UNTESTA.MAK` compiles `UNTEST3.C`, shown in Figure 9, to create an object module named `UNTESTA.OBJ`. (Note that the compile command line uses the `-Fo` option to give the object file a different name than the source code file.) The `UNTESTA.OBJ` file is linked to create `UNTESTA.EXE`. `UNTESTW.MAK` is similar, except that the compile line also uses the `-D` (define) option to define the identifier `_UNICODE`.

`UNTEST3` displays only one set of output lines. The `printf` and `wprintf` functions have been replaced with `_tprintf`. The `strlen` and `wcslen` functions have been replaced with `_tcslen`. The definition of the character string now uses the `TCHAR` data type. All character strings are enclosed in the `_TEXT` macro. Note that the program includes both `WCHAR.H` and `TCHAR.H`. The output from `UNTESTA.EXE` and `UNTESTW.EXE` is identical except for the line that reports the number of bytes occupied by the string in memory.

WHAT HAVE WE LEARNED? We've seen how to use both ASCII strings and Unicode strings in the same source code file, and how to have a single source code file that can be compiled for either ASCII or Unicode. Of course what I've discussed in this column doesn't represent the extent of converting an existing program to Unicode. You'll have to find any places in your code where you've previously assumed that the size of a character is a byte or where you access a binary buffer or file as if it were a collection of characters. (You can download the `UNTEST` program and source code file from PC Magnet's Programming Forum, archived as `UNI.ZIP`.)

In the next installment of this column, we'll examine how the Windows NT API provides methods for using ASCII and Unicode in the same program, or for creating a single source that can be compiled for either. The methods are a little different from those provided by the C compiler, C runtime library, and header files, but as you will see, the results are similar. □

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*Don Edmunds
Palm Harbor, Florida*

►PC MAGAZINE: Yes you can, and in fact it would be a very good idea. All you need is an available slot; a single parallel port card for an ISA bus system can cost as little as \$10. The only potential problem is whether you have an IRQ conflict. LPT2 uses IRQ5 which is generally available, but IRQ5 is also used by some expansion cards such as digitized sound cards. It's possible to have two devices share the same IRQ as long as you don't use the two devices at the same time, but you should only do this as a last resort.

It is not a good idea to use a mechanical A-B switch with a laser printer. Hewlett-Packard's warranty will not cover damage caused by the use of one. A jolt of juice along the wrong signal wire can cook your printer's controller.

The only problem with adding a second parallel port is that you may have software that doesn't know how to address LPT2. This is easily overcome, since the port assignments are managed by pointers within your computer's memory. Using a tiny program called LPTPORT, you can trick the computer by swapping the two ports' assignments. To switch the assignments back again,

just run LPTPORT one more time. You can download LPTPORT.COM (and its companion documentation file LPTPORT.DOC) from the ZiffNet Software and Utility Library (GO ZNT:SOFT-LIB).—*Alfred Poor*

Peripherals

CAN YOUR FAX MACHINE DOUBLE AS A SCANNER?

✓TIP I've seen a product called a fax scanner which transforms any fax machine into a full-page scanner for your computer. The price is under \$100, but requires that you have a Class 2 fax modem. Is this a good deal?

*Alvin Woo
San Francisco, California*

►PC MAGAZINE: Whether or not it's a good deal depends on how you intend to use it. A fax machine is a very low-resolu-

tion scanner, and it may not suit your needs.

A standard fax machine has a resolution of 100- by 200-dpi (dots per inch). Each scan line is printed twice at the receiving end, using a 200-dpi printing device. Fine mode faxes are scanned at 200-dpi in both directions.

Even the fine mode on fax machines is much coarser than the resolution of most scanners and printers used today. Laser printers start at 300-dpi, and most scanners have resolutions of 300- to 400-dpi. Any image scanned from a fax machine will look coarse and the text will vary in thickness.

In addition, a fax scanner creates bi-level images; this means it can only produce black and white images, not gray. If you're scanning photographs or other grayscale images, you probably won't get an acceptable image. A grayscale scanner will create an image that your computer can convert to black and white, using *dither* patterns to simulate shades of gray on your printer. (*Dithering* is a technique

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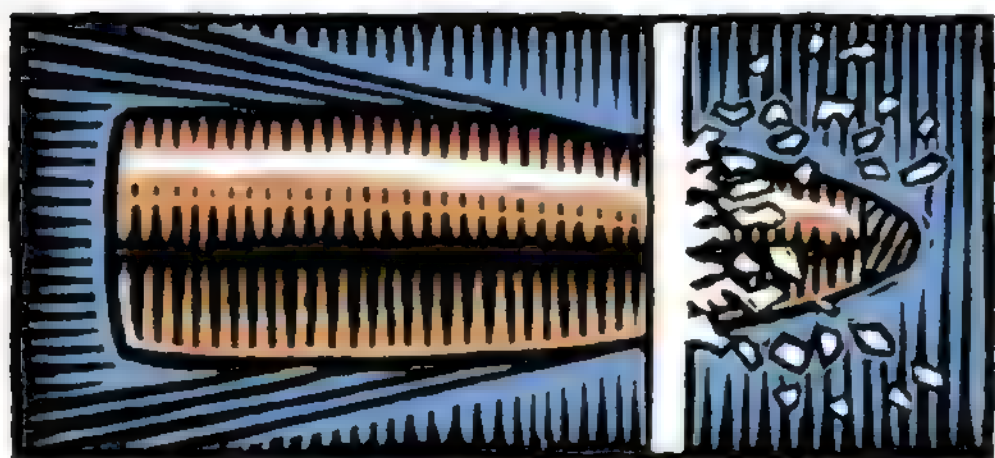
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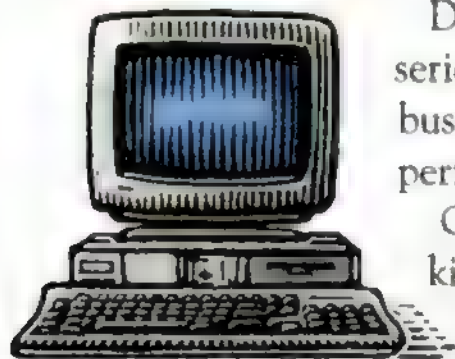
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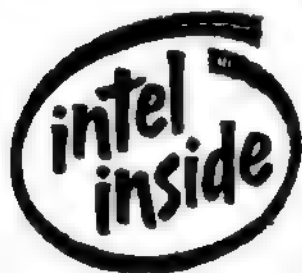
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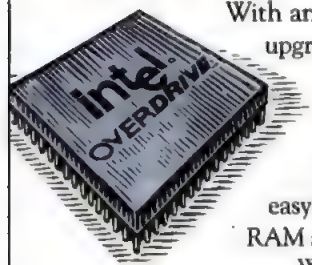
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that creates varying shades of gray, or of other colors, by treating areas of an image as groups of dots that are colored in different patterns.)

So if you want to create images of even moderate quality for use with your computer, you may be better off with a low-cost hand scanner that creates grayscale images.

If you already have a standalone fax machine and a fax modem in your computer, and they're connected to different telephone lines (or to different extensions in the same building), you can easily check the quality of the images you would get: Just send a fax to your computer.—*Alfred Poor*

EJECTING PARTIAL PAGES FROM LASER PRINTERS

► **PC MAGAZINE:** As more and more people switch from impact dot matrix printers to laser printers, they encounter a new problem: How can you make the laser printer spit out a partially printed page? Most programs will eject the page automatically at the end of a print job, but there are some programs that won't.

Also, if you use the DOS redirection feature to send screen output to the printer (such as sending a directory listing to the printer using the command `DIR > PRN`), DOS won't eject the page. With an impact dot matrix printer, you can simply crank the platen handle (if it has one) to advance the paper or you can take the printer off-line and use a paper advance button.

Nearly all LaserJet-compatible printers have a formfeed button, but most PostScript printers do not. And besides, since people often share laser printers, the formfeed button may not be within

easy reach. You can eject pages using a simple DOS command, but the details vary depending on whether your printer is a LaserJet-compatible or a PostScript printer. For a LaserJet-compatible printer, enter the following command at the DOS prompt:

```
ECHO ^L > LPT1
```

where ^L is Ctrl-L and LPT1 is the first parallel port; change this if your printer is connected to a different port. When you press Enter at the end of this line, a page will be ejected from your printer. If the printer's page buffer holds any data, that information will be printed and the buffer will be cleared.

LaserJets use a printer command language known as PCL, and this language has many of the same control codes impact dot matrix printers use. The formfeed character is ASCII 12, or Control-L. PostScript printers are a little trickier, since PostScript is more or less a programming language in its own right. As a result, you need to send a specific command to the printer:

```
ECHO SHOWPAGE > LPT1
```

Press Enter, and this will eject the page. Note that PostScript is not case-sensitive, so it doesn't matter whether you enter the command in uppercase or lowercase characters.

If you use this trick a lot, you may want to put the appropriate command in a batch file called, say, `EJECT.BAT`. Then, you can simply type `EJECT` at the DOS prompt to eject a page from your printer.—*Alfred Poor*

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Operating Environments

ANNOTATING A WINDOWS HELP FILE

TIP When using a Windows program's Help menu, I often like to make notes for future reference. I've discovered a neat way to do this, and I don't mean by writing the notes down on paper. You can actually include your notes in the application's Help file. First, select the desired help topic. Then, choose Annotate from the Edit menu. A mini-notepad will pop up, allowing you to type in your notes. When you're done, just click the Save button. You can tell if a help topic has a note attached to it by the paper clip at the beginning of the help topic.

Joe Caverly
St. Thomas, Ontario, Canada

► **PC MAGAZINE:** Annotations aren't actually stored in the .HLP file; they occupy

a separate file with the same filename and the extension .ANN. You can annotate help for any application that uses the built-in Windows help system. Annotations are limited to about 2K characters, and only one annotation per help page is allowed. You can use the clipboard to paste in text, or copy the annotation back to the clipboard and paste it into a document. Annotating Help files is a great way to preserve special tips you discover yourself, or tips you learn from the Solutions column!

By default, the paper clip that signals an annotation is green, matching the color of *jump text* (text that you click on to reach another page of help). This works fine with the default white background, but it may be hard to see if you're using a different color background. You can change the jump color by editing WIN.INI.

Here's how: Locate the JumpColor= line in the [Windows Help] section; if it doesn't exist, create it. The three numbers following JumpColor= define the amount of red, green, and blue in the

color, from 0 to 255. For example, JumpColor=128 0 0 would turn the paper clip from green to red, and JumpColor=0 128 128 would make it cyan. Pick a color that contrasts nicely with your background. The change will take effect the next time you start Windows.—Neil J. Rubenking

FINDING THE SIZE OF A DIRECTORY

I store all of my data on 3.5-inch high-density floppy disks. Sometimes, one disk fills up, and I want to move *some* of the data to another one. Typically, one of my disks has about 25 directories on it, each holding an average of about 15 files.

In order to decide which directories to move to a new floppy disk, I must know the size of each directory. I've tried both the DIR and TREE commands in DOS; they show me a list of all the directories—but not the size of each one.

I don't want to go into each directory to see its size—that would take 25 multiphase steps. I just want to see a list of

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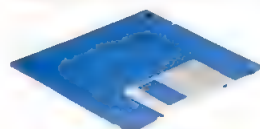
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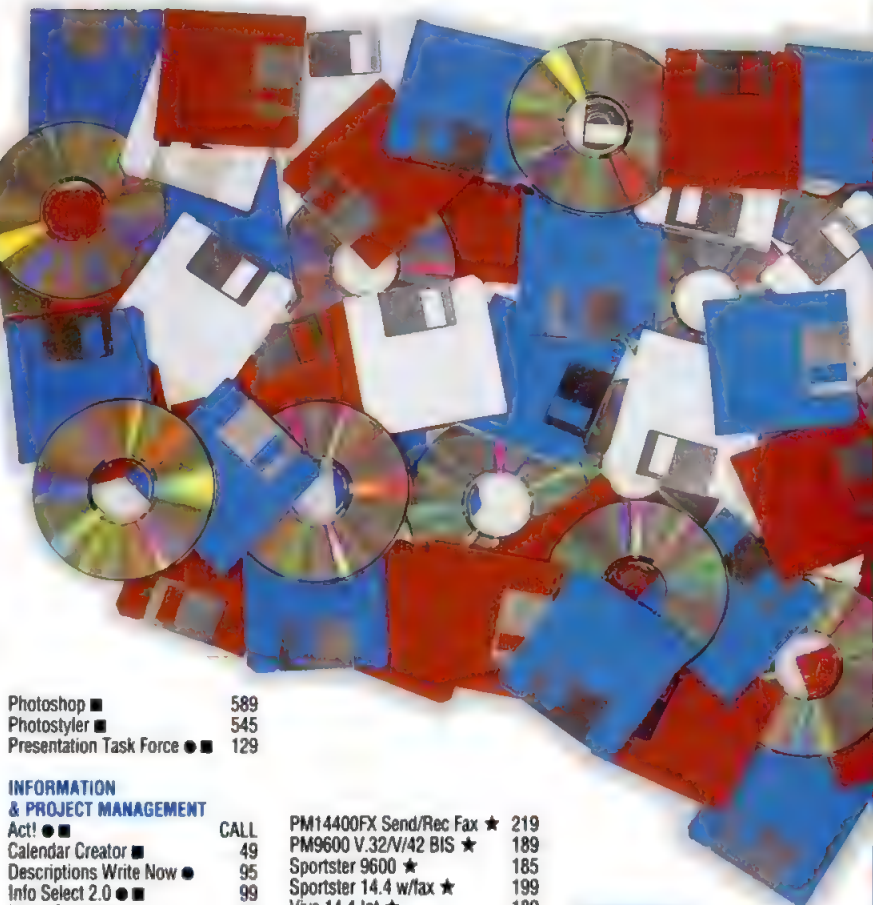
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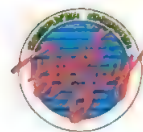
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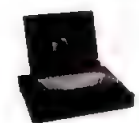
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CIRCLE 235 ON READER SERVICE CARD

the directories and the size of each on one screen *all at once*. Do you have any suggestions?

Robert D. Hoagland
Charlotte, North Carolina

► **PC MAGAZINE:** The solution lies with several DIR switches introduced in DOS 5.0. Most important is the /S switch, which causes DIR to report on the specified directory and all subdirectories below it. Before each individual directory listing there's a header line like "Directory of C:\DOS," and after each there's a summary line with the number of files and total bytes in that directory.

The problem is, however, that the output of DIR /S gives too much information, since it includes the name, size, and date/time stamp for every file in every directory. Studying the output, I determined the letter "i" was contained in *all* the lines of interest and in *none* of the individual filename lines since filenames appear in uppercase. Piping the output through the FIND filter and selecting only lines containing "i" trimmed the output down to size.

The /L switch forces DIR to report filenames in lowercase. On the chance that the user might have configured DIR to use /L as the default, I added a /-L switch to counteract it. A /O:N switch puts the directories in alphabetical order. The final command looks like this:

```
DIR A:\ /-L /S /O:N | FIND "i"
```

Figure 1 shows an example of its output. You can simply pipe the output through the MORE filter, like this:

```
DIR A:\ /-L /S /O:N | FIND "i"
| MORE
```

DIRECTORY LIST WITH SIZES

Sample Output

```
Volume in drive A has no label
Volume Serial Number is 1B26-3964
Directory of A:\
    2 file(s)             0 bytes
Directory of A:\ONE
    3 file(s)            566 bytes
Directory of A:\TWO
    1 file(s)           1042 bytes
Total files listed:
    6 file(s)           1608 bytes
```

Figure 1: By filtering the output of the DIR command, you can get a listing of directories with the number and size of the files.

if it exceeds the size of your screen.

—Neil J. Rubenking

LONG FILENAMES IN WINDOWS

✓ **TIP** You don't have to let Windows restrict you to DOS's eight-letter filenames. You can put file icons on your Windows desktop with descriptions up to forty characters long. Just double-click on the file icon, and Windows loads the file into the appropriate application automatically. Here's how to do it.

- Create a new program group by selecting File | New | Program Group. Call this the Files group, or give it a name related to the files you'll be putting in it.
- Find the icon of the application for which you want to create files. Copy it into the Files group by Ctrl-dragging it repeatedly, once for each file you want on your desktop. Repeat this step for any other applications.
- Highlight one icon in the Files Group and select File | Properties.
- In the box marked Command Line, you'll see the path to the application. Add one space after this, then type the full pathname of your file. For example, this line should now read

```
C:\WINWORD.EXE C:\DATA\MYLETTER.DOC
```

- Replace the text in the Description box with a file description of up to forty characters. You can use any of the characters on the keyboard, including space.
- Select OK to go back to Program Manager. Your icon now has the file description you gave it.

You can mix any selection of file icons in a file group and have files from different applications in the same file group. File icons can be moved or copied into

any existing program group on your desktop. You can have multiple icons of the same file in different groups. If the file is moved or copied into the Startup group, Windows will load it on startup.

Deleting the icon will *not* delete the file. You can only do this in File Manager or in DOS. To remove the icon from your desktop, use Program Manager's File | Delete.

You can also change the

icon—this won't affect the way things work. Go to Properties in Program Manager's File menu. Select Change Icon, Browse, and then choose MOR-ICONS.DLL from the Windows directory. This gives you a selection of icons from which to choose, or, if you prefer, you can design your own with third-party utilities.

David Field
Merrimac, Massachusetts

► **PC MAGAZINE:** I never thought of using the Program Manager item description for an extended filename, but it certainly does work! For a number of files, the process is even easier than the process that is described above. Windows has the ability to associate a given file extension with a particular application. For example, .WRI files are associated with Write, .TXT files with Notepad. When a file has an associated application, giving it a long description in Program Manager is really easy.

Bring up File Manager and locate the file. Now drag the file from File Manager into the Files group in Program Manager. It will automatically display the icon of its associated program. Highlight the icon, press Alt-Enter to bring up the Properties dialog, and fill in your forty-character description. Easy!

If you've chosen to have Windows wrap icon titles, select Window Arrange Icons after you're done adding files. Windows will arrange the icons in the Files group so their titles don't overlap. If your icon titles are not wrapped, you'll have to arrange the icons by hand. To make Windows wrap icon titles, choose the Desktop applet from Control Panel and check the box labeled Wrap Title.

—Neil J. Rubenking



KEEPING TRACK OF FILENAMES

Ⓢ Because of the eight-character file name limitation in DOS, I often find it difficult to remember the filename for a particular report or letter. Is there any way in Word for DOS to print the filename on a document—for example, on

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Word Processing...Spreadsheets

the left-hand side at the bottom of the first page—without having to type it manually? It's also important that the filename show only when I want it to, so I can have it on my copy of a letter, but not the copy I send.

Vittorio Vallini
Torino, Italy

►**PC MAGAZINE:** Word actually includes built-in features that will solve this problem. But judging from how often this question comes up—not only about Word, but WinWord and WordPerfect, too—it would seem that document management in all these programs is among the best-kept secrets in word processing.

To automatically print the path and filename of a document in Word 5.0, simply choose Print, Options from the menu, and make sure the Summary Sheet option is set to Yes. In Word 5.5, choose File, Print, and Options, and make sure the Summary Info Option check box is checked. In either version, once you've set the feature, Word will print a summary information page at the beginning of each document, showing the filename, creation date, revision date, and character count, along with other information you may want to include. Because the summary information is on a separate page, you can throw it out, or file it with the document when you want it.

To see the current summary sheet for a file, and add or change information if you like, choose Library, Document-retrieval from the 5.0 menu, or File, File Management in 5.5, and highlight the filename. With 5.5, you'll also have to choose Summary.

One of the additional pieces of information the summary sheet can include is a title of up to 40 characters. To have Word 5.0 automatically prompt you for a title and other information when you first save a file, choose Options from the menu, and set the summary sheet choice to Yes. In 5.5, choose Utilities Customize and make sure the Prompt for Summary Info check box is checked.

(Note that the document-retrieval screen, or File Management in 5.5, also offers a query function, Search in 5.5. You can use this to search for a file by various criteria, including key words entered as part of the summary informa-

tion, and any text in the document.)

WinWord provides all the same features—and some additional capabilities that I'll ignore here for lack of space. You'll find the check box for printing summary information in print options, which you can reach by choosing Tools | Options and then Print in the Category list, or by choosing File | Print and then the Options button.

The check box for prompting for summary information is among the save options, available by choosing Tools | Options and then Save, or by choosing File | Save As and then Options. To see WinWord's more sophisticated equivalent of Word's document retrieval screen, select File | Find File. The Find File dialog box can optionally show the document summary as you highlight each filename.

WordPerfect 5.1 also provides a document summary similar to Word's, with room for up to 68 characters for a document name. To set WordPerfect to automatically prompt you for summary information the first time you save a file, type Shift-F1, then choose Environment, Document Management/Summary, and set Create Summary on Save/Exit to Yes.

If you set the Long Document Names option to Yes as well, you can see about 30 characters of the full document names when you list files. And as mentioned in the manual, but not shown as a choice on-screen, you can also print the document summary screen for the current document. All you need to do is type Shift-F8, choose Document, Summary, and then Shift-F7 to print.

As you might expect, WordPerfect for Windows, Version 5.1 and 5.2, offers similar features (and additional capabilities that I don't have room to discuss in detail here). To find the check box for Create Summary on Save/Exit, choose File | Preferences | Document Summary. To see the summary for the current file, choose Layout | Document | Summary. To open WordPerfect's File Manager, which optionally lets you see the document summary for files as you highlight the filenames, choose File | File Manager.—M. David Stone

Spreadsheets

STATISTICAL FUNCTIONS AND ERR CELLS

✓**TIP** Spreadsheets are great for keeping track of results calculated from input data. Unfortunately, I often end up with a spreadsheet with incomplete data, which nevertheless contains useful information. If a blank or (temporarily) missing item of data is referenced in the denominator of a formula, my spreadsheet program—Quattro Pro—returns the value ERR. A problem then arises when I attempt to perform statistical analysis of a data set that includes blanks or ERRs. The normal statistical functions return ERR whenever a referenced value is ERR. The upper portion of Figure 2 demonstrates the problem.

My solution is to use the database statistical functions instead of the standard statistical functions, and to create a criterion range that filters out the cells containing ERR. Here's how to do this:

First, name a block containing the columns you want to average. Be sure to include the column headings, as these will become database field names.

Next, set up and name a two-row criterion table. Copy the row of column headings to a vacant spot on the spreadsheet. Under the first of these copied headings, enter the formula

```
#NOT@ISERR(ColumnName)
```

substituting the correct field name for the

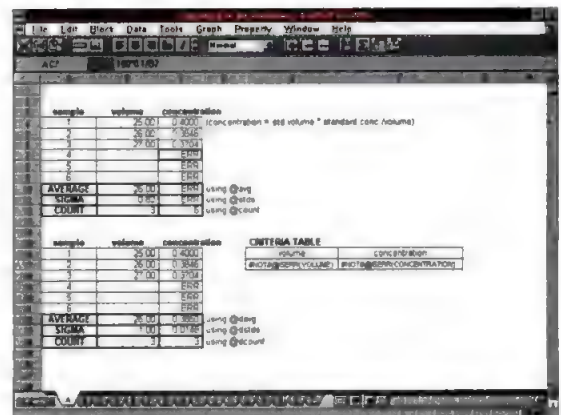


Figure 2: The bottom of this spreadsheet solves the problem at the top, filtering out ERR cells with a criterion table.

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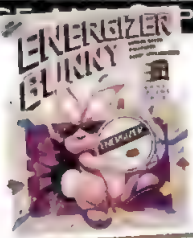
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first column. Repeat this for the remaining columns.

Finally, under the first column to be averaged, enter the formula

```
@DAVG(LIST,0,CTABLE)
```

where LIST is the name of the block containing the columns to be averaged and CTABLE is the name of the criterion table. This procedure, shown in the bottom portion of Figure 2, produces the correct averages. Similar methods can be used to obtain valid standard deviations and counts.

Al Censullo

San Luis Obispo, California

► **PC MAGAZINE:** The statistical functions in Quattro Pro and Lotus 1-2-3 return ERR if any element in their range arguments is an error value. This is an annoyance, but it's also an essential safety and convenience feature. An ERR value returned by a statistical function alerts you to the presence of one or more ERRs in your input range.

If you want the functions to ignore ERRs and simply perform their calculations on the remaining input values, you have to filter the input range and produce a second set of inputs that excludes the ERR cells. You could do this by issuing a Data Query command, extracting the non-error cells to a new range on the worksheet, and then applying the statistical functions to that new range. Or, as Mr. Censullo has done, you can accomplish the same thing in a more compact manner by means of database statistical functions.

Mr. Censullo's filtering criteria, in the table at E16..F17, exclude all of the records in his database (B15..C21) that have ERR values in either the Volume field or in the Concentration field. If his database included NA values in addition to blank cells as placeholders for unavailable data, he could have expanded the criteria to exclude records with NAs as well as those with ERRs, using formulas like the following:

```
#NOT#@ISNA(Column1Name)
```

These formulas should be in the same row as the #NOT#@ISERR() formulas,

with the appropriate field names copied above them too.

It might be tempting to "trap" error values at their source by using @IF formulas. The formula

```
@IF(B7=0,"",100*0.1/B7)
```

would return a null string at B7 as a proxy for the ERR value initially there. But beware of strings (labels) in statistical-function ranges! Quattro Pro and 1-2-3 evaluate label cells exactly as if those cells contained zeros, so null strings in C7..C9 would produce incorrect and misleading results in C10..C12.

The latest version of 1-2-3 for Windows includes a set of "pure" statistical functions that ignore text values. These functions—@PUREAVG, @PUREMIN, and so on—can be used on ranges that incorporate null strings or other labels as proxies for error values. But Mr. Censullo's approach seems sounder to me, since it alerts you to the presence of null values, even though it might be a little more trouble to implement.

—Craig Stinson

Databases

OPTIMIZING FIELD SIZES REVISITED

✓ **TIP** Recently I read the letter Optimizing Field Sizes from Vern Semrad in the May 12, 1992, Databases column. Generally, on a large database, I've found that indexing is faster as demonstrated in Mr. Semrad's letter. But a large database also creates a large index file, regardless of whether or not it is an .MDX or an .NDX. If you don't have enough disk

space, you can determine the maximum usage for a single field using the following command (in dBASE IV and FoxPro):

```
CALCULATE MAX(LEN(TRIM(Fld)))  
TO Used
```

where Used is the memory variable holding the result of the calculation.

You can create a function that returns the amount of disk space that could be saved as follows:

```
FUNCTION SizeSave  
PARAMETER cFld  
CALCULATE MAX(LEN(TRIM(&cFld)))  
TO result  
RETURN (LEN(&cFld)-result)  
* RECCOUNT()
```

In dBASE III PLUS, you could use the code shown in Figure 3 to calculate the result without using any additional disk space.

Adam L. Menkes

Boulder Creek, California

► **PC MAGAZINE:** Despite the increasing capacities of today's disk drives, disk space is at an all-time premium. If you don't have enough disk space to use the techniques presented in earlier installments of this column, you'll want to keep Mr. Menkes's tip handy. His use of the CALCULATE command is a simple alternative that works well.

The MAX column function (not to be confused with the MAX built-in function used in Figure 3) returns the maximum value in a column.

In our CALCULATE command, the length of the trimmed field value is evaluated for every record, and the maximum value is returned. The SizeSave function goes one step further and calculates the

Determining Optimal Field Size in dBASE III Plus

```
nCounter = 0  
GO TOP  
DO WHILE .NOT. EOF()  
    nCounter = MAX(nCounter, LEN(TRIM(Fld)))  
    SKIP  
ENDDO  
? "Maximum usage is " + LTRIM(STR(nCounter)) + " out of " + ;  
  LTRIM(STR(LEN(Fld)))  
? "Savings potential is " + LTRIM(STR(nCounter * RECCOUNT()))
```

Figure 3: A dBASE III Plus code fragment that determines the maximum space usage and how much space can be saved in a field, without the disk overhead that results from creating an index.

space you would save by reducing the size of the field. Note that the RECCOUNT() function used in the calculation includes any records marked for deletion in its count.

Readers might also want to consider a shareware program I came across recently called DBFOPT. This is a stand alone read-only utility written in C that will scan and analyze a .DBF file and report the smallest possible lengths the fields can be without truncating data. The program works with dBASE III, dBASE IV, Clipper, and Microsoft FoxPro database files and is available from Jason Vu, P.O. Box 5063, Clearwater, FL 34618-5063. Registration is \$12, or \$25 if you want the C source code.—*Sal Ricciardi*

QUICK SUMS IN PARADOX

TIP The "Calculating Sums In Paradox" tip in the April 27, 1993 installment of Databases, which uses the CSUM() function, is a great idea. Still, there's an even shorter way to do it. Paradox has a function called Imagecsum() that can be used in the following way:

```
MESSAGE Imagecsum()
SLEEP 2500
```

to shorten the Sumqty script presented there to two lines.

*Bill Darron
Fair Lawn, New Jersey*

► **PC MAGAZINE:** The Imagecsum() function differs from the Csum() function in that it is one of the restricted view functions. These functions respect the restricted view shown in the detail section of a multitable form and operate only on those records. Otherwise, when not in a multitable form, they operate on the entire table.

When you use a linked multitable form in Paradox, the detail part of the form represents a restricted view of the detail table. For example, the detail part of the form might show only those orders for a specific customer.

The restricted view functions respect the current view. If the Imagecsum() function is called while the cursor is in the detail column of a multitable form, the sum that it returns reflects only those

detail records linked to the current master record. For example, if the form currently displays orders for John Doe, the sum from Imagecsum() would reflect only the orders for Mr. Doe. Csum(), on the other hand, always returns the sum for the entire table.

All of the Image functions (Imagecount(), Imagecoverage(), and so on) respect restricted views. If you call the Imagecsum() function while the cursor is positioned in an unrestricted view, the function returns the sum for the entire table. Thus it can be used to improve the Sumqty script presented in the April 27 issue, so that it works on the entire table when not in the detail section of a multitable form and sums just the detail portion when in the detail section of a multitable form.

In addition, the Imagecsum() function does not require the table name and column name parameters required by the Csum() function, because it automatically works on the current column of the current image. This lets us shorten the Sumqty script from four lines to the two shown in Mr. Darron's letter.

—*Sal Ricciardi*

Graphics

HEADER HELL

❓ In "EPS for Everyone" (February 9, 1993), you suggest deselecting the header option when creating an Encapsulated PostScript (EPS) file because it may cause printing problems. But later on, you say that when the EPS file is imported into a document it will appear as a bounding box on the screen. Isn't bounding box information contained in the header?

My understanding is that in addition to the actual image, an EPS file includes other elements: the encapsulation header that contains the bounding box information and a preview image TIFF file. I have difficulty reconciling my understanding of EPS files with your instructions. If you deselect the header, how can the bounding box information be present? Can you explain this apparent contradiction?

*Frank Barr-David
Darling Point, Australia*

► **PC MAGAZINE:** Your understanding of the structure of an EPS file is correct. Every EPS file contains an image in PostScript format as well as a header, which includes the name of the creator program and bounding box—or size—information. If an EPS file contains only these two elements—the PostScript picture and a header—it will appear on-screen as a gray bounding box because Windows does not support display PostScript.

If you want to see a screen preview of an EPS file, the EPS header must also contain a bitmapped TIF (usually low-resolution) representation of the PostScript picture. When you export an EPS file from a graphics program (like CorelDRAW or Adobe Illustrator), you are often given the option of including or excluding a screen preview TIF image. But you are never given the option of producing an EPS file without a header.

Your confusion is caused by the fact that Aldus PageMaker does not export EPS files directly. Like most desktop publishing programs, PageMaker can only print PostScript files. In an effort to circumvent this limitation, I suggested a workaround that takes advantage of an option in the Windows Printer Control Panel to create EPS files instead of PostScript printer files.

When you fiddle with the PostScript options in the Windows Printer Control Panel, you are actually dealing with a different header. Each time you print a PostScript document, Windows sends a header for the entire job to the printer. This job header controls elements such as font usage for the entire document. You can think of this as a nested relationship. Each PostScript document file has a header, but within a document each Encapsulated PostScript picture also has a header. The headers do not conflict, because they contain different kinds of information.

If you leave the Send Header with an Each Job option selected in the Windows Control Panel when you create an EPS file, you'll be adding a document-level header to the EPS file along with the internal EPS header. If you subsequently incorporate the EPS file into another document and then print the document, you'll be downloading two—possibly conflicting—document-level headers.

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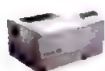
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FONT CATCH-UP

❷ I never paid much attention to fonts before, since all I had was a dot matrix printer. But now I'm trying to sort out all of the information on fonts to get the most out of my new Epson ActionLaser II printer.

What's the difference between bitmapped and scalable fonts? Are soft fonts or hard fonts more convenient? Can I use TrueType, Adobe, or Bitstream fonts on my printer? Which fonts will work with all of my DOS and Windows programs?

*Raul E. Gomez
Chevy Chase, Maryland*

► **PC MAGAZINE:** Let's start with the basics. There are two primary font types: bitmapped and scalable. bitmapped fonts are raster images: Each letter consists of a series of dots. bitmapped fonts are generated at a particular point size and—like bitmapped graphics—can not be resized. If you try to double the size of a bitmapped 10-point Times font, you'll seriously degrade the quality of the printed letterform.

In contrast, scalable, or outline, fonts consist of mathematically defined curves and are not associated with a particular point size. As the name implies, scalable fonts can be resized—or scaled—without any loss of quality. So you can change 10-point Times to 20-points without degrading the quality of the final printed letters.

Fonts are also described as being ei-

ther *hard* or *soft*. *Hard*—short for hardware—refers to fonts that are either resident in your printer's ROM or stored on a hardware cartridge you've installed in the printer. As you might guess, *soft* stands for software and refers to fonts that are created and stored on your computer's hard disk. Soft fonts are downloaded to the printer for each print job or work session.

Finally, there's the issue of font format. If you go shopping for standalone font packages, you'll have to choose between two scalable formats: Microsoft TrueType and Adobe Type 1. Obviously you can buy fonts directly from either Microsoft Corp. or Adobe Systems. But even if you decide to purchase fonts from a third-party foundry such as Bitstream, Agfa Division, Casady & Greene, or Monotype Typography, you'll find they offer one or both of those formats.

Trying to sort through all of these op-

*Hard fonts get high
marks for convenience since
they don't eat up any
of your printer's RAM.*

tions abstractly or arbitrarily is a good way to get very confused. Instead, start by appraising the capabilities of your printer and the compatibility of your software. The Epson ActionLaser's base configuration includes PCL IV compatibility, a handful of bitmapped hard fonts, and 512K of RAM.

Hard fonts get high marks for convenience. Since they are resident in the printer, you don't have to worry about downloading them. And because they are hardware-based, they don't eat up any of your printer's RAM. If you stick with the hard fonts that are resident in your particular printer, you'll find your choices limited to Courier, Courier Bold, Courier Italic, and Courier Bold Italic in either 10 or 12 points. You can add hard fonts to the printer fairly easily because the ActionLaser II is compatible with HP font cartridges. Because the ActionLaser II emulates the HP LaserJet IIP, however, all of the cartridge fonts will be bit-

mapped, not scalable. You'll get tired of hearing this, but configuring your software to work with cartridge fonts is easier if you're working with Windows-based applications and harder if you are working with DOS-based applications. The Windows Control Panel lets you choose from a comprehensive list of HP font cartridges when you configure your printer. But unless your DOS applications offer printer drivers that are aware of add-in cartridges, you'll be forced to deal with messy escape code sequences in order to access the new fonts.

There is one way to add scalable hardware fonts to your ActionLaser II, and that is to purchase an Adobe PostScript Identity Card from either Epson Direct or Adobe. Doing so will convert your PCL 4 printer into a PostScript device and give you access to 35 scalable Adobe Type 1 fonts, which are built into the PostScript interpreter. You must then reconfigure all of your software to print to a PostScript printer.

There are a number of different ways you can add scalable soft fonts to your computer system. And once again you'll find it easier to handle soft fonts within the Windows environment. For example, TrueType fonts are directly supported by Windows 3.1—you simply can't use them with a DOS application. Likewise, if you want to print Adobe Type 1 soft fonts to your Epson ActionLaser II using the default PCL 4 printer mode, you'll find that only Windows-based font scaling programs—such as Adobe Type Manager, Bitstream FaceLift, and Zenographics SuperPrint—can handle the job of printing Adobe Type 1 fonts to a non-PostScript printer.

It is possible to use Adobe Type 1 fonts with both your DOS and Windows applications, but it requires that you transform your ActionLaser II into a PostScript printer by installing the Adobe PostScript Identity Card mentioned above. Neither Windows nor DOS will send the soft fonts to the printer automatically, so be prepared to download the soft fonts yourself to the printer's memory before you print your document.

In order to use any kind of soft font with your particular printer, however, you must add more memory. A full page of text or graphics printed at 300-dots-

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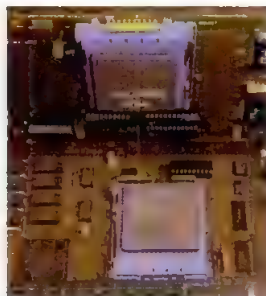
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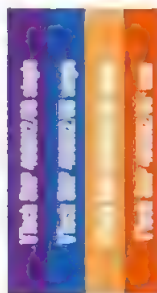
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Graphics...Networking...Languages

per-inch requires a minimum of 1 megabyte of printer RAM. If you intend to print pictures or if you're downloading soft fonts to the printer, you'll need much more memory. Luckily the ActionLaser II is upgradable to a full 5MB of RAM. For more information on the Adobe PostScript Identity Card or RAM upgrades contact Epson's accessory department at 800-873-7766.—*Luisa Simone*

Networking

ROUTING INCOMING FAXES

❓ We use a fax server to send out hundreds of faxes a week from dozens of PCs on our LAN. We'd also like to receive incoming faxes, but we really don't know how to handle them. Having the network administrator read every incoming fax is a big job, and it deprives everyone of what little privacy a fax provides. Is there any way to steer incoming faxes directly to their intended recipients?

*Michael Slattery
Greenville, North Carolina*

► **PC MAGAZINE:** The technology for internally routing faxes continues to improve, and there are now five good techniques you can use instead of forcing someone to read every incoming fax. Here are the five techniques, along with a brief description of each:

- "Read" a line of text: Routing incoming faxes by reading a line of text involves using OCR software to look for a specifically formatted line containing the name of an addressee. It works, but callers must know how to format the fax.
- "Read" DTMF tones: DTMF (dual-tone multifrequency) refers to the dialing tones produced on a phone's keypad. Some devices allow the sender to generate Touch-tone signals after the connection is made in order to designate the receiver. This technique is useful because it can accommodate many recipients, but it requires special actions on the part of the sender.
- Recognize the incoming line: If your fax server uses a multiline adapter, it can route faxes to individuals or to workgroups based on the incoming line.
- Recognize the incoming fax machine:

Recognizing the number of the incoming fax machine, called the Customer Subscriber Identification (CSID), is a useful trick because the sender doesn't need to take any special actions, but the sender must use a specific fax machine.

- Recognize distinctive rings: Distinctive ringing is a technique offered by your local telephone company. The telephone company sends calls directed to different phone numbers over the same incoming line using different ringing patterns. Some modems and fax machines can use distinctive ringing to determine when they should answer, and some fax servers can use the distinctive ring to route the incoming fax to a specific mailbox. This technique doesn't require any knowledge

*There are some viruses that
burrow into legitimate
files, and if they are copied
across the network, the
infection can be spread to
other computers.*

or action on the part of the caller, and the caller can use any machine to place the call, so it's quite convenient.

There are products, like Alcom's Lan-Fax, that can use any or all of these techniques.—*Frank J. Derfler, Jr.*

PROTECTING YOUR NETWORK FROM VIRUSES

❓ Do viruses spread across networks? We've had two computer virus infections in the last year, but nothing seems to have gone across our LAN. Was this just luck, or do we need to take precautions?

*David Wallisch
Chicago, Illinois*

► **PC MAGAZINE:** By far, the most common source of computer virus infection is the boot sectors of floppy disks. Since the boot sector information doesn't travel across the network, common viruses like the Hong Kong virus or the

Dark Avenger don't cross networks or bulletin board systems. Your best protection against these forms of computer viruses is to remove the floppy disk drives from the PCs in your organization. Let the PCs boot from their internal hard disks and load new applications across the network. You'll not only protect against the introduction of viruses, but also against the theft of valuable business information that unscrupulous people might carry away on floppy disks.

There are other types of potent viruses, however, that don't live in a floppy disk's boot sector; instead, these viruses burrow into legitimate files. If these files are copied across the network, the infection can be spread to other computers.

There are two approaches in virus-scanning software to running checks for viruses on a network file server: running the software on a client PC or on the file server itself. These two approaches are similar to the techniques used for backing up file servers (virus checking is even an option on some backup software such as Emerald Systems Xpress Librarian).

The programs that run on a client PC are useful for scanning a specific virtual drive at a specific time of day. They work with any number of servers and with any type of server software. The programs that run in the server, like the Central Point Anti-Virus NLM or VAP for Netware, can continually scan files as they are copied or moved across the network. These products do take some processor cycles, but NetWare servers typically have CPU power to spare.

—*Frank J. Derfler, Jr.*

Languages

BLIND PASSWORD ENTRY IN BASIC

✓ **TIP** Some of the programs I write need to accept a secret password, so I had to be able to prevent BASIC from echoing the text that is entered to the screen. Many programs use a technique whereby data is hidden from someone looking over an operator's shoulder by displaying asterisks or some other symbol as each character is entered.

BLINDENT.BAS

Complete Listing

```
***** BLINDENT.BAS
'
'Subprogram and demo shows how to accept passwords and other text
'without echoing it to the screen.

DEFINT A-Z
DECLARE SUB BlindEnter (Text$, Row, Column)

CLS
LOCATE 10
PRINT "Enter some data:"

Text$ = SPACE$(10)      'set the maximum field length
COLOR 0, 7              'input with reverse colors
CALL BlindEnter(Text$, 10, 19)
COLOR 7, 0

LOCATE 15, 1
PRINT "You entered: "; Text$

SUB BlindEnter (Text$, Row, Column)

' Where: Text$ = The entered string (returned to caller)
'       Row   = The line where the data is entered
'       Column = The left column where the data is entered
'
' At entry, BlindEnter expects Text$ to be filled with spaces in
' order to know the maximum length of the field.
'
' CHR$(176) = █ is displayed in place of the actual key stroke,
' but that can be changed to anything you like in the code below.
'
' The only editing key that is accepted is the backspace key.

MaxLength = LEN(Text$)      'save the incoming string length
Text$ = ""                  'then clear it to start fresh

DO
    LOCATE Row, Column, #
    PRINT Display$: SPC(MaxLength - LEN(Display$));
    IF LEN(Text$) = MaxLength THEN EXIT SUB

    DO
        K$ = INKEY$
        LOOP UNTIL LEN(K$)          'wait for a keypress

        SELECT CASE ASC(K$)         'handle keys as needed

            CASE 13, 27              'Enter or Escape keys
                EXIT SUB

            CASE 8                   'backspace key
                IF LEN(Display$) >= 1 THEN
                    Display$ = LEFT$(Display$, LEN(Display$) - 1)
                    Text$ = LEFT$(Text$, LEN(Text$) - 1)
                ELSE
                    BEEP
                END IF

            CASE ELSE
                IF ASC(K$) >= 32 THEN 'accept character keys only
                    Text$ = Text$ + K$
                    Display$ = Display$ + CHR$(176)
                ELSE
                    BEEP
                END IF

        END SELECT

    LOOP

END SUB
```



Figure 4: The BlindEnter subprogram lets you add password-style hidden input to BASIC programs.

Since I didn't find a solution in any of my commercial libraries, I wrote the accompanying BlindEnter subprogram and short demonstration (see Figure 4). BlindEnter accepts keystrokes one at a time with BASIC's INKEY\$ but echoes the CHR\$(176) shaded box character instead of the actual text that was entered. BlindEnter provides minimal editing and recognizes only the Backspace, Enter, and Escape keys (in addition to the password characters you enter). But supporting Insert and Delete operations is not really appropriate for a subroutine where the text is not visible.

*Kirk Woodward
Grapevine, Texas*

simple to disable the beeps in BlindEnter by removing the ELSE and BEEP statements in the two places they appear.

—Ethan Winer

Online ACCESSING ZIFFNET FROM OUTSIDE NORTH AMERICA

One of the things I miss here in Israel is the easy access to ZiffNet and PC MagNet services. Are you considering setting up a similar installation to serve the Middle East and Europe?

*Yoram Alperovitch
Hod-Hasharon, Israel*

► **PC MAGAZINE:** You can prevent BASIC from echoing entered text when using the LINE INPUT command by simply setting the screen colors to black on black using COLOR 0, 0. But LINE INPUT does not provide a way to limit the length of the entered text, and moreover, the user will see nothing at all, which can be confusing. Mr. Woodward's subprogram provides an ideal solution, though I personally do not like programs that beep every time an invalid key is pressed. It's

► **PC MAGAZINE:** We don't have to set up a similar installation outside of North America—CompuServe already did it for us. ZiffNet and PC MagNet run on computer space Ziff-Davis leases from CompuServe, so both systems share the same software and access network. CompuServe has made many enhancements to its worldwide network over the past few years, including putting direct

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At the TERMINAL= prompt, type D1. You'll then get an @ in response; type 3300014617 and hit Enter and you'll be connected to the CompuServe network. From that point, to join ZiffNet and PC MagNet, you can follow the directions found on page 12 of this issue. If you have any problems, call CompuServe's support line in Israel at 3-290466.

The entire list of countries with CompuServe nodes is too long to reproduce here. If you're looking for the access number for other countries, call CompuServe's customer support in the USA at 614-457-8690, or check your local phone book or phone company for the number nearest you.—Joe Salemi □

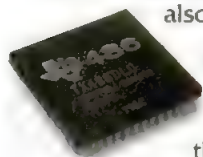
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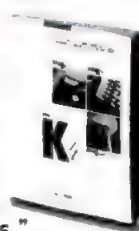
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250MB	12ms	3.5" 1"H	Conner	IDE	CP30254.....	229.....	249
340MB	12ms	3.5" 1"H	Western Digital	IDE	WD2340A.....	299.....	319
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- 1.2 Mb 5.25" Floppy Drive
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- ✓ Diamond Stealth 24 VESA Local Bus SVGA Video Card
- 1 Parallel, 2 Serial & 1 Game Port
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Processor:

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486DX-50 SL-Enhanced
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RAM:

4 Mb, expands to 20 Mb

Hard Drive:

80 Mb, 120 Mb, 200 Mb or 340 Mb

Screen:

10", 640 x 480 VGA resolution
Backlit display
Color - 256 colors
Monochrome - 64 gray shades

Battery Life*:

Active-Matrix Color - 3 hours
Dual-Scan Color - 4 hours
Monochrome - 6 hours

Weight:

Color - 6.9 lbs.
Monochrome - 6.4 lbs.

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Active-Matrix Color	005511 \$3199	005526 \$3399	005541 \$3599

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*Battery life measured with Power Management enabled. Actual battery life may vary.

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For extra power take advantage of the SubNote's PCMCIA Type II slot. It lets you insert credit-card sized PC cards for modems, flash memory, network adapters and more.

Get the picture? Now get the Elite 486SX-25 SubNote and get a whole new view of portable computing!

486SX-25 SubNote

Model	Item #	Price
80 Mb	005575	\$1499
120 Mb	005576	\$1549
200 Mb	005577	\$1639
340 Mb	005578	\$1799

Elements:

Processor:
Intel 486SX SL-Enhanced upgradeable processor

Processing Speed:
25 MHz

RAM:
4 Mb expands to 12 Mb

Hard Drive:
80 Mb, 120 Mb, 200 Mb or 340 Mb

Screen:
10", 640 x 480 VGA resolution

Backlit display
64 gray shades

Battery Life*:
5 hours

Weight:
3.9 lbs.

512K DRAM plus 64K VRAM
for turbo bus accelerated video technology

Simultaneous video
83 keys with 101-key emulation

Built-in trackball

External 1.44 Mb, 3.5" floppy drive

Advanced Power Management

Nickel metal hydride battery

One parallel and one serial port

External VGA and keyboard connectors

One PCMCIA Type II slot

FREE AC adapter and utilities disk

FREE MS-DOS 6.0 installed

Elite 486SLC-33 Color/Monochrome Notebook

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486SLC-33 Notebooks

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200 Mb	005471	\$1889

Monochrome

Model	Item #	Price
80 Mb	005446	\$1209
120 Mb	005451	\$1279
200 Mb	005456	\$1399

Elements:

Processor:
Cyrix 486SLC-33

Processing Speed:
33 MHz

RAM:
2 Mb RAM, expands to 8 Mb

Hard Drive:
80 Mb, 120 Mb or 200 Mb

Floppy Drive:
Built-in 1.44 Mb 3.5"

Screen:
Color - 9", 256 colors
Monochrome - 10", 64 gray shades

Video RAM:
Color - 512K
Monochrome - 256K

Keyboard:
83 key with 101-key emulation
2-button thumbball mouse

Weight:
Color - 5.7 lbs. with battery
Monochrome - 5.4 lbs. with battery

Battery Life*:
Color - 4 hours
Monochrome - 6 hours

640 x 480 resolution

Simultaneous video

Advanced Power Management

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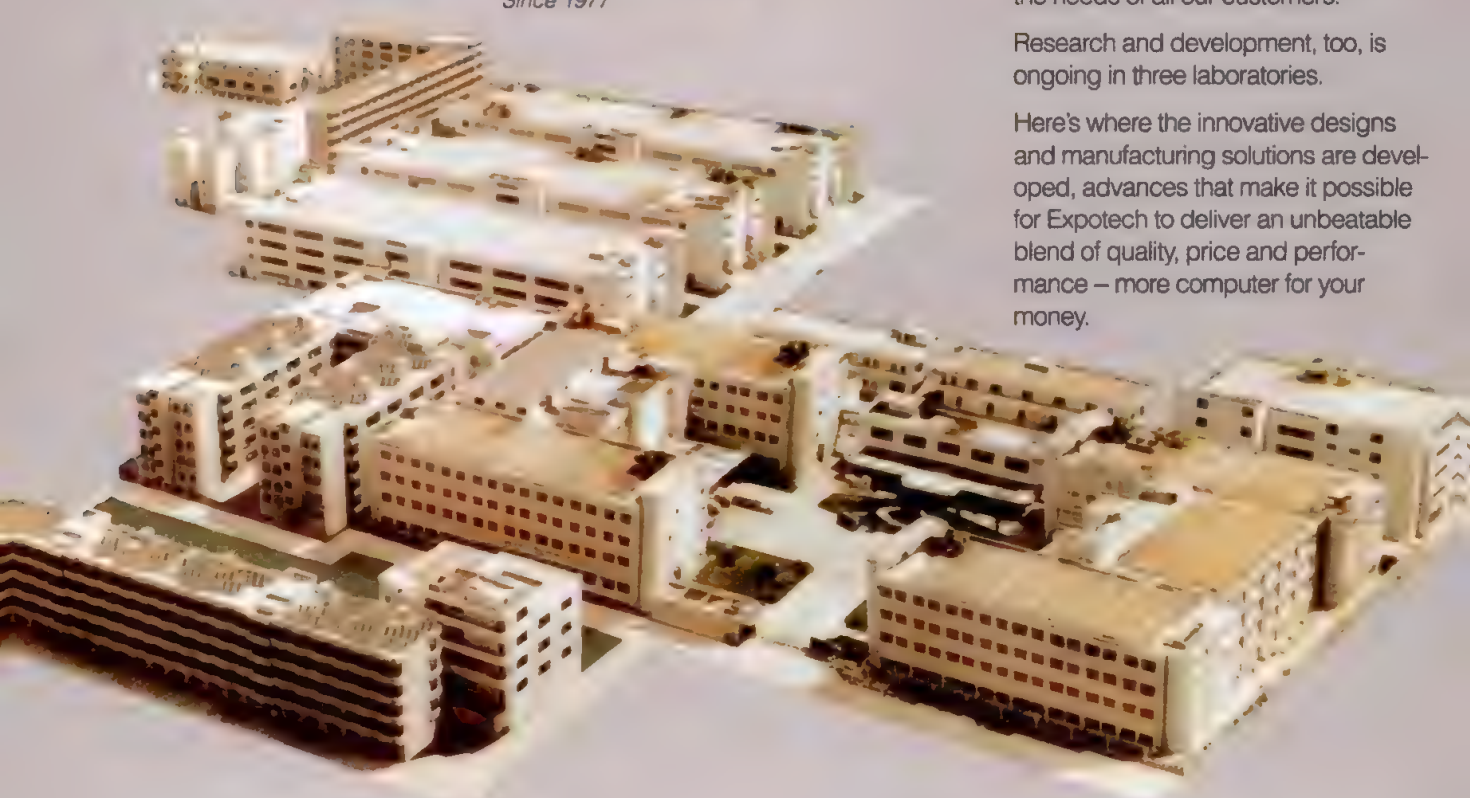
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REMOTE DIAGNOSTICS	YES				OPTIONAL	
24 HOUR TECH SUPPORT	YES			YES	YES	YES
FREE ON SITE SERVICE	YES	YES	YES		YES	YES
OPEN 7 DAYS / WEEK	YES	YES		YES		
EXPRESS PARTS SERVICE	YES	YES	YES	YES		
FAX TECHNICAL ADVICE	YES	YES	YES	YES		
SAME DAY SERVICE	YES	YES	YES	YES		
SYSTEM FEATURE						
ANTI VIRUS SOFTWARE	YES					
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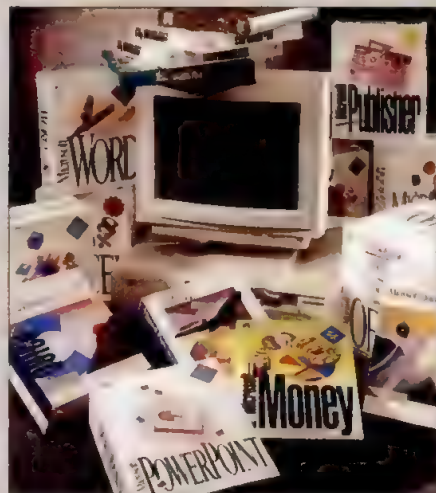
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Screen	Model	Hard drive	Price
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Monochrome	123W	120MB	\$1799
Monochrome	123W	170MB	\$1899
Dual scan color	123W	120MB	\$2449
Dual scan color	173W	170MB	\$2559
Active matrix	173W	170MB	\$3629

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\$1699*



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- Trackball, MS-DOS, Windows 3.1

Model	Screen	Hard drive	Price
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Contura	Dual scan color	209MB	\$2879
Lite	Monochrome	120MB	\$2089
Lite	Monochrome	209MB	\$2369
Lite	Active mono	120MB	\$2819
Lite	Active mono	209MB	\$3099

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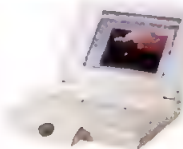
- 486 processor
- 640x480 VGA display, 256 colors
- Local bus video**
- MS-BallPoint/Quickport connector
- MS-DOS, Windows 3.1

Processor	RAM	Display	Price
186SX/25	4MB	Enhanced color	\$2199*
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186DX/250	4MB	Active	\$3899

**except DX/240

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- MS-Windows for Workgroups

Screen	Price
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Dual scan color	\$3129
Active matrix color	\$3699

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- Bubblejet printer built-in
- 116 cps, 360x360dpi
- Auto sheet feeder built in

Hard drive	Price
135MB hard drive	\$2589*
180MB hard drive	\$2799

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\$2589*



NEC

UltraLite Versa

- 4MB RAM, expandable to 20MB
- 2 PCMCIA slots
- Local bus graphics
- MS-DOS 6.0, Windows 3.1, trackball

Processor	Screen	Hard drive	Price
186SL/25	Monochrome	120MB	\$2749*
186SL/25	Monochrome	180MB	\$2999
186SL/25	Active color	120MB	\$4799
186SL/25	Active color	180MB	\$5049
186SL/33	Monochrome	180MB	\$4229
186SL/33	Monochrome	250MB	\$4439
186SL/33	Active color	180MB	\$4299
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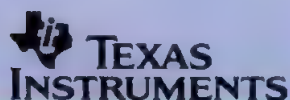
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PC Magazine Award Winner

"The TI TravelMate 4000 WinDX2/50 continues to be the top gun of the portable world, outperforming several DX2/66-based systems."

— PC Magazine, August 1993

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TI's TravelMate 4000E WinDX2/50 is the "no compromise" 486 notebook that performs like a desktop PC.

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- ▲ NEW high-speed video system for fast Windows performance
- ▲ NEW 4mm full-travel keyboard with true desktop feel
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- ▲ 120MB hard drive
- ▲ Pre-installed DOS 6 and optimized Windows 3.1



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Model	Screen	Hard drive	Price
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T1950 486SX20	Monochrome	200MB	\$2049
T1900 486SX20	Dual Scan Color	120MB	\$2449
T1900 486SX20	Dual Scan Color	200MB	\$2699
T1950 486DX2/40	Monochrome	120MB	\$2159
T1950 486DX2/40	Monochrome	200MB	\$2399
T1950 486DX2/40	Dual Scan Color	120MB	\$2769
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T4600

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- ▲ BallPoint mouse with QuickPort
- ▲ MS-DOS 6.0, Windows 3.1

Screen	Hard drive	Price
Monochrome	120MB	\$2629*
Monochrome	200MB	\$2799
Active Matrix Color	120MB	\$4099
Active Matrix Color	200MB	\$4359
Active Matrix Color	340MB	\$4799

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Fully Equipped Multimedia Computer

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486SX/33	170MB	\$1099
486DX/33	170MB	\$1239
486DX/33	260MB	\$1349
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486DX/66	260MB	\$1599

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Processor	Hard drive	Price
486SX25*	170MB	\$999*
486SX33	210MB	\$1249
486DX2/66	250MB	\$1739

*486SX25 does not include modem
NEC SVGA color monitor \$319
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\$999



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- Local Bus graphics
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Model	Hard drive	Price
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486DX33	240MB	\$1469
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4/33	120MB	—	\$1299
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4/66d	—	210MB	\$2099

Color SVGA monitors start at \$399.99

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Bravo LP

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- 486 processor
- Accelerated local bus graphics
- Local Motion video capability
- Pentium/Overdrive upgradable
- MS-DOS 6.0, Windows 3.1, Mouse

Model	RAM	Hard drive	Price
4/25s	4MB	170MB	\$1179*
4/33	4MB	170MB	\$1449
4/33	8MB	340MB	\$1899
4/66d	8MB	340MB	\$2449

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Source: Review Computer Shopper, July & August, 1993



Winmark 3.11

Source: Review-BYTE Magazine, June 1993



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Source: Review-Windows Sources, June 1993



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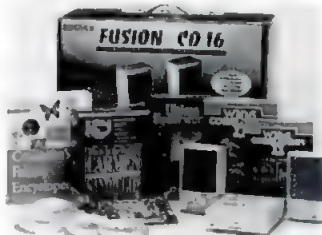
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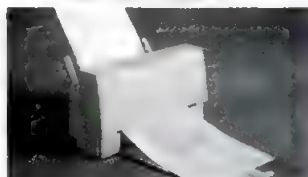
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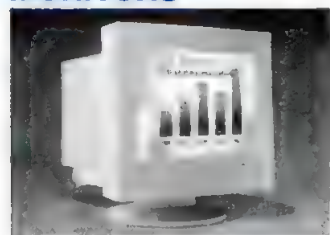
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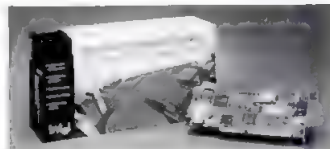


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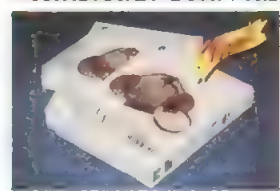
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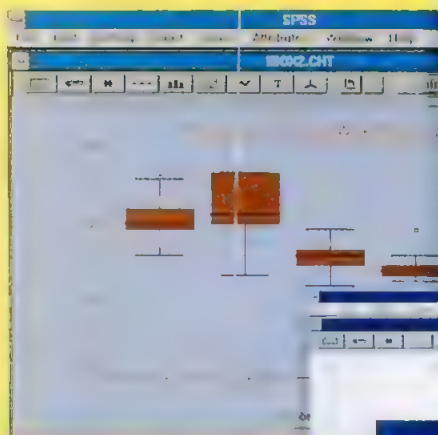
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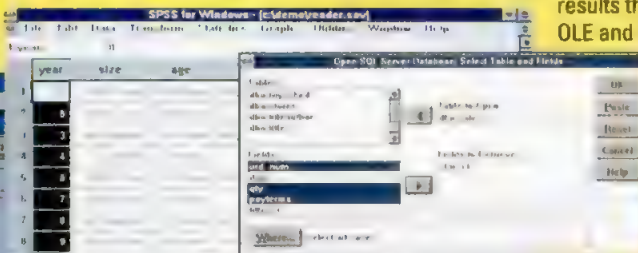
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T2000S/E2200SX/T1800/1850.C	8Mm	PC-PA2002U	429.00
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Premium 386/33	1Mtg	500718-002	50 00
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	1Meg Module	1136-00 001	74.00
	4Meg Module	112534-001	249.00
DesPac 386/20E	1Meg Exp Bd	1136-00 001	149.00
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	Silentwriter 1097	HP LaserJet 4
Postscript	Yes, Level 2	optional
PhotoMatch	Yes	No
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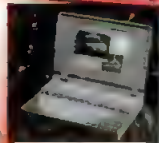
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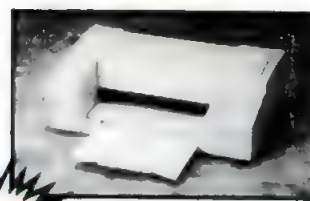
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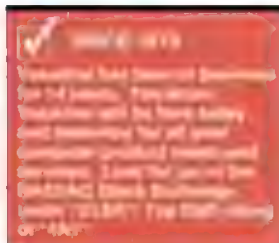
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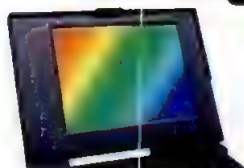
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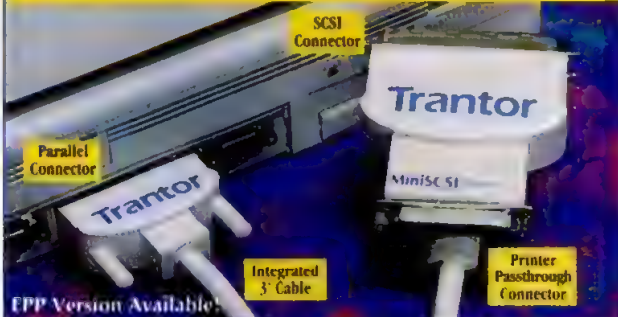
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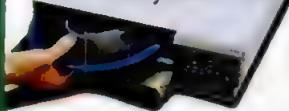
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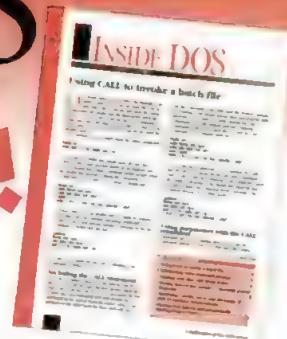
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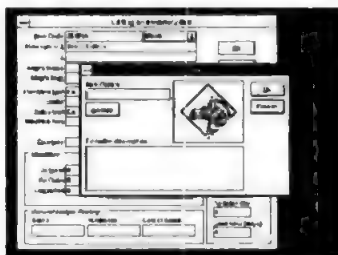
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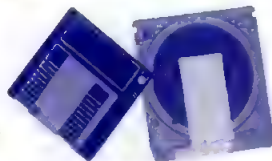
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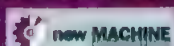
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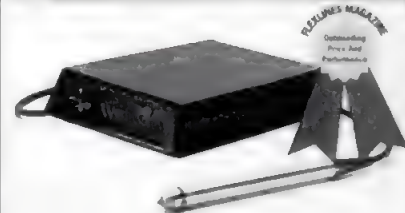
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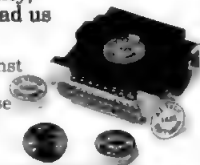
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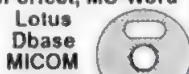
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1. Do you work in a DP/MIS dept.?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)

01. ☐ Manufacturer-Computer Equip., Computers, Software
02. ☐ Manufacturer-Aerospace
03. ☐ Manufacturer-Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government
11. ☐ Research and Development
12. ☐ Data Processing/Computer Service
13. ☐ Health/Medical/Legal Service
14. ☐ Engineering/Architecture

15. ☐ Agr./Const./Mining/OW/Transp./Utilities
16. ☐ Non-Computer Retailer/Dist.
17. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:

01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office?

01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?

01. ☐ Now 03. ☐ In 7 to 12 months
02. ☐ In 4 to 6 months 04. ☐ No definite plans

9. Number of employees in your entire company:

01. ☐ 25 or less 03. ☐ 100-499 05. ☐ 1000 or more
02. ☐ 26-99 04. ☐ 500-999

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Coming Up

PC MAGAZINE'S 10TH ANNUAL PRINTER BLOCKBUSTER

Mainstream Lasers

Desktop lasers for under \$500. PostScript for under \$1,000. Output of 600 dpi. Fast RISC processors. Laser manufacturers are lowering prices and packing in more features than ever before. We review 37 lasers that print up to 11 pages per minute.

Network Lasers

Network laser printers are now more than fast, high-volume machines with hefty paper handling. Many offer internal network interface cards for direct connection anywhere on the network, automatic emulation switching, fast bidirectional parallel ports, remote management, and automatic switching among network OSs. We review 13 printers that print 12 pages per minute or more and have exciting network-specific features.

Ink Jets

Falling prices, laser-like output, quiet operation, and color are some of the reasons ink jets are rapidly taking over the dot matrix home-office and small-business market. We review six new additions to the market, including the color HP DeskJet 550C.

Dot Matrix

The reports of the death of the dot matrix printer are greatly exaggerated. Dot matrix printers still excel at low-cost, high-volume printing and multipart forms, and probably always will. We review 35 printers that range from dirt cheap home-office printers to network-capable high-speed workhorses.

Color Printers

High-quality color printing is more affordable than ever. High-end color technologies—ink jet, thermal wax transfer, thermal dye transfer, and solid ink—have built on strengths and mitigated flaws. We review ten new high-end printers, including the Kodak ColorEase PS Printer and HP DeskJet 1200C/PS.

Printer Service

Find out the results of our annual Printer Service and Reliability survey. Some companies are rated better than ever and some have taken a surprising tumble in consumer confidence.

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After Hours

STRATEGY GAMES: Battle Chess 4000, Caesar, Global Conquest, Maelstrom, Shadow President

GAMES

Go Head-to-Head Against the Ultimate Opponent: Five Mindbenders Challenge Your Strategy Skills

BY BARRY BRENESAL

Strategy games can be summed up in the phrase, "many options, studied at leisure." Compared with other software entertainment genres such as arcade, sports, and graphic adventure games, strategy-oriented programs are more open-ended. The five examples we've evaluated here offer excellent variety. They give you the opportunity to try nearly anything, with no time limits. Success goes not to the swift, but to the thoughtful.

INTERPLAY PRODUCTIONS INC.

Battle Chess 4000

No, Battle Chess 4000 isn't the 4,000th upgrade to Interplay Productions' popular chess program. Rather, it's the third product in a series in which animated pieces attack one another with gusto as they stalk across the board.

Battle Chess 4000's best enhancement is its improved animation. As in several other recent games, Claymation has become the medium of choice. Excellent 256-color Super VGA resolution helps bring these clay models to life.

The game has a futuristic theme, with send-ups of such science fiction favorites as *Star Wars* and *2001: A Space Odyssey*. Scientists replace bishops,

and battlemechs take over for rooks. Battle Chess 4000's humor, though, remains as wildly slapstick and imaginative as ever. Jedi knights accidentally drop their laser swords; Amazon space queens (remember those unbelievably horrific films of the 1950s?) perform incredible feats of jujitsu.

Animation sequences this complex, of course, have their price: lengthy loading pauses on anything slower than a 25-MHz 386-based PC. Caches help, but not by much. Nor is

machine than its predecessors. The library of opening moves has increased tenfold, from 30,000 to 300,000—more than any other chess game. It also has a "force opening line" option that lets you decide the computer's initial strategy—exploring multiple variations of the Sicilian Defense, for instance.

As in previous releases, Battle Chess 4000 supports two-person play via modem or serial port. It also offers more than a dozen levels of computer playing strength. You can give it a maximum time limit per move or tell it to think only as long as you do. You can even allow Battle Chess 4000 to consider its moves while you are making yours.

Battle Chess 4000 continues to lack some features found in the competition, however—notably in Chessmaster 3000. Battle Chess 4000 doesn't import or export lists of moves or board positions. It supports algebraic notation only when printing games for future reference. There are still no blindfold or multiplayer tournament options. And even though you can control Battle

Chess 4000's playing strength and database access, it pales before Chessmaster 3000's extensive slide controls and host of selectable computer "personalities."

A mixed review, then, for Battle Chess 4000. It's still short on some features, but its memory access and its visuals show marked improvement. Humor and animation remain its outstanding characteristics, and if you want the best computerized opponent available, look no further.

Battle Chess 4000, \$59.95.

Requires: 640K RAM, 1MB expanded memory, 13MB hard disk space, DOS 3.1 or later. Interplay Productions Inc., 17922 Fitch Ave., Irvine, CA 92714; 800-969-4253, 714-553-6655.

Circle 458 on reader service card

IMPRESSIONS SOFTWARE INC.

Caesar

Combine SimCity with the Commentaries of Julius Caesar and you'll have some idea of Caesar. You begin as governor of a province, with power to design and construct its capital. Create reservoirs, lay pipes, and erect temples, residences, colosseums, theaters, and marketplaces. Build roads and connect them to outlying villages to increase trade. Raise armies and patrol for barbarian incursions.

Over time, people will move into your brand-new city. They'll set up shops, pay taxes, and contribute to the general prosperity. Seven advisers will keep you in-



ACTION! Battle Chess 4000's Claymation action is laced with futuristic humor.

the hit ratio very good: Too many files are loaded once, then discarded for long periods of time. Luckily, you can switch to the game's ordinary 2-D chessboard display when the humor and delays become a bit too much.

SERIOUS CHESS MACHINE

Humor aside, Battle Chess 4000 is a more serious chess

Caesar

formed of your province's continued health. Your financial analyst, for instance, graphs 14-year trends of tax revenues, city funds, and population. And don't forget to check the six maps that detail urbanization, water distribution, administration (tax collecting), road layout, land value, and trouble areas.

Meanwhile, Caesar (the leader, not the game) never sleeps. He carefully monitors your progress in four areas: peace, culture, prosperity, and empire. Reach the goals that he has set and you will be offered a similar position in more challenging circumstances. You can ultimately



Caesar's messengers courteously follow your lead for 2,000 years as you govern your own Roman Empire.

rise from the rank of Citizen to that of Caesar.

As a model of urban development, Caesar is less sophisticated than SimCity. This game ties income directly to population density, so that the more people there are in a given area, the more money enters the municipal coffers. SimCity, on the other hand, sees these factors in their proper, unrelated perspective. Enormous wealth can exist in a solitary mansion or a block of condos.

Caesar, however, easily wins on visual grounds. The high-resolution VGA screens

faithfully mirror your city's structure as it grows from a town of modest but attractive huts, temples, and cottage industries into a metropolis of broad boulevards, thriving markets, and stately palaces.

One of the most pleasing aspects of Caesar is its willingness to follow your lead, becoming the kind of game you want. Do you seek advancement in the Empire and approbation from the Emperor? Achieve his goals and accept his new posts. Are you a perfectionist who just enjoys tinkering with your first command? Refuse the Emperor's offer. He won't be offended. His messengers will arrive every 25 years over the next two millennia, courteously extending similar proposals.

It's actually not a bad idea to mingle these two approaches. Develop a prosperous city, then pay yourself an outstanding salary. Once you get to your next province, apply these funds over and above the pit-tance that the Emperor initially provides.

Commands in Caesar are entered through a series of buttons on three toolbars. You'll have to get used to this approach, but the symbols are well chosen and eventually become second nature. Some welcome shortcuts help—like typing the letter F to enter the Forum where your seven advisors work.

Caesar's weakest points show when your armies attack raiding barbarians: an unappealing screen, and success that depends almost entirely upon luck. Alternatively, Im-

pressions Software furnishes links into another of its products, Cohort 2. This is an excellent, detailed strategic simulation of Ancient Roman warfare. The transfer of game control is quick and flawless, enabling you to move swiftly from Caesar to Cohort 2 and back again.

Caesar's documentation rates high marks for its large, easily viewable screens and its extensive notes. It is, however, wildly inaccurate on a few supposedly historical points. In any case, let us

praise Caesar rather than bury it. This game is endlessly entertaining, visually stunning, informative, and varied enough to satisfy even the most ardent fan of open-ended games.

Caesar, \$59.95. Requires: 640K RAM, 2MB hard disk space, DOS 3.0 or later. Impressions Software Inc., 7 Melrose Dr., Farmington, CT 06032; 203-676-9002; fax, 203-676-9454.

Circle 459 on reader service card

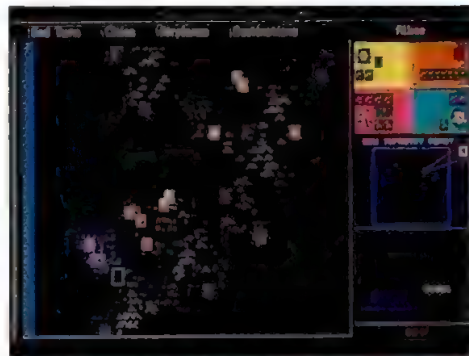
MICROPROSE SOFTWARE INC.

Global Conquest

Strategic war games come in two categories: representational and abstract. Within the latter are two more categories: straightforward and downright silly. Global Conquest has a virtual monopoly on the latter.

The genesis of Global Conquest lies in one of the oldest computerized strategy games: Empire, a four-sided battle for world military domination. What has kept the concept of

Empire fresh for more than a decade are its ease of use combined with an open-ended structure. A small number of attack units fight on a map whose geographic features and city locations change from game to game. The element of



Global Conquest brings fresh wit to its variations on several popular war game themes.

potential alliances adds still further opportunities for complexity and the losing of friends.

To all this plotting, Global Conquest brings elegant line drawings and a zany sense of humor.

The humor shows in two ways. First, there's the elaborate, whimsical documentation, which reaches its slightly askew apex in a tutorial that satirizes every blood-and-guts sergeant you've ever seen in books or film. It's supposedly written by John "Hardbones" Shrimply. No more need be added.

Equally curious are the "chance event" cards, an idea that comes from board game favorites from years past. Global Conquest is certainly original in its description of events, however. Space Pirates, for instance, involves "wandering Space Gypsies who steal one-quarter of the world's resources while everyone is watching Wheel of Fortune." Another, Trench Fever, causes the planet's troops (from all four sides) to

Global Conquest

leave their defensive postures and visit video rental stores. They return, four turns later, after seeing all the good ones.

But Global Conquest has other positive values, humor aside. It is several games in one. The most common variant, "King of the Hill," pits all four players against an unaligned capital in an unknown location. "Live and Let Die" awards victory for the greatest amount of destruction among opposing forces. "Guns or Butter" enthrones, instead, the player who has the largest accumulation of income points at the end of 60 turns.

Global Conquest supports multicomputer games. Connection options include both direct serial (null-modem) and preexisting networks. There's also an on-line chat feature, useful for harassing other human players during a timed game.

MicroProse has produced an excellent variant on an old, strategy-based favorite in Global Conquest. It's attractive, easy to learn, fun to play, and always different.

Global Conquest, \$39.95.

Requires: 640K RAM, 2MB hard disk space, DOS 3.0 or later. MicroProse Software Inc., 180 Lakefront Dr., Hunt Valley, MD 21030; 800-879-7529, 410-771-0440; fax, 410-771-1174.

Circle 460 on reader service card

MERIT SOFTWARE

Maelstrom

"Hail, Overlord! Welcome to your first day on the job. You have a full schedule, but everything has been carefully arranged for easy access. You'll be overseeing the four planetary departments, and you'll want

to hire the executives for each. We've prepared individual background checks, so feel free to accept or reject anyone.

"As new chief of Harmony, you'll want to pay your vid-phone respects to the rulers of more than 20 other inhabited planets. We have dossiers on the societies of each. You'll also want to consider detailed spaceship configurations to build, potential mining sites to test, research areas to explore, and security options to implement.

"That should do it. But first, would you mind answering a call from Speaker Terr'don of Thornwood?"



In Maelstrom, a full day's work awaits you as the leader of the planet Harmony.

So it goes: your initiation into the complex universe of Maelstrom. Your troubles there, however, are only beginning. Harmony is home to nearly three-quarters of the known intergalactic supply of Fitzholnium, an unstable fuel with enormous trade and military implications. Every other planetary government with empire-building aspirations or simple paranoia wants to get their economic talons into Harmony.

Each government department will clamor, threaten, and beg for resources. Increased funding and staff to security means a tighter net against infiltration; to the military, it's more ships and a

heightened state of preparedness against attack. More resources for mining translates into more test drill sites, Fitzholnium, and revenue for Harmony. Research, by contrast, pays off sporadically—when a project finishes development, and not before. But the results can be a small financial windfall when you sell the rights, or secret weapons designs for your next spaceship. Your choice. Only one thing is certain: There isn't enough of anything to satisfy anybody.

Meanwhile, you must deal as best you can with other personalities in an ever-changing universe, strategically balancing

all your options and sacrificing wherever possible. Keep in mind, also, that the chance you missed today may turn into the ghastliest mistake possible by tomorrow.

Maelstrom's interface handles its abundant wealth of options with ease. Each of the main screens—central, military, research, mining, security, communications, budget, and disk operations—can be quickly accessed by mouse or function keys.

Secondary screens for personnel, shipbuilding, battle, and the galactic map are readily available. You can also control the passage of time, a handy feature many government heads might envy.

Visuals are excellent, particularly the space battles fought on 3-D grids, and the extremely fluid, digitized VGA animation sequences. Too bad there's no sound, barring a few musical notes to signal game pause. Memory is the

culprit: Maelstrom expects 607K of RAM.

If you relish challenges, don't pass up Maelstrom. Its unique combination of role-playing and strategy elements will bring you back long after finishing the storyline.

Maelstrom, \$69.95. Requires: 1MB RAM, 12MB hard disk space, DOS 5.0 or later. Merit Software, 13707 Gamma Rd., Dallas, TX 75244; 800-238-427, 214-385-2353; fax, 214-385-8205.

Circle 461 on reader service card

D.C. TRUE LTD.

Shadow President

Tired of taking on space aliens or the Luftwaffe singlehandedly? Try stepping into a role that's a little less stressful, like President of the United States.

You begin Shadow President by setting the broad outlines of a national budget and tax structure. These will determine both your popularity (very important if you want to get reelected) and how much aid is available—in social, economic, military, intelligence, and political categories.

You can reward or penalize any nation at will once you jump to the international map. You also have up to six other foreign policy options in any of these five areas. Your range of choices is surprisingly broad—everything from negotiating a peace settlement between two hostile parties to planning a coup d'etat.

The kicker to all this money and clout is that it can't buy you instant change to national attitudes or instant solutions to global problems. The rest of the world in Shadow President isn't a series of passive verbs. As in reality, every shadow nation has its own agendas, both stated and secret.

Shadow President

Shadow President doesn't offer artificial intelligence, or "learned conduct," as it is sometimes called. The game proceeds from the opposite premise: that if you program enough variables governing conduct, the results will mimic actual behavior in real-life situations. Each of Shadow President's 152 nations includes more than 200 coded variables, considerably more than any current computer-based simulation.

The results justify the effort you put in. Shadow President's nations play their parts with fidelity to the originals. And like the originals, they maintain a degree of flexibility that supports gradual change. It takes work to win any shadow nation to your cause.

You certainly won't lack for information in Shadow President to help with your decision making. Your cabinet is extremely diligent and can prepare briefings at a moment's notice.

The Secretary of State, for example, will tell you about a selected country's anxiety concerns, strategic world and regional values, and its "interaction mood" with the United States. He'll also pass on the kinds of aid they want, how much, and what his own department recommends. Whether to take his advice or not is up to you. (Much of Shadow President's information derives from the CIA World Factbook, whose 1990 edition is loaded with the program and available for review anytime.)



As Shadow President, the decisions you make will keep peace or destroy your cities in a nuclear holocaust.

If you want to examine a visual representation of all this information, try one of the 30 filter buttons at the bottom of the screen. These buttons use color to illustrate a variety of topics, including ethical behavior, GNP growth rate, conquered territories, and social outcry.

Visuals are, however, the least inviting aspect of Shadow

President. Dark green and bright orange lines on a black background hardly provide the kind of frame such a product deserves.

Still, there is more than enough activity in this game to make up for its lack of impressive screens.

If all you want is Super VGA and 3-D polygonal landscapes, go fight the Luftwaffe. If

you want a strategic simulation of unparalleled realism, try Shadow President. □

Shadow President, \$54.95.
Requires: 640K RAM, 6.5MB hard disk space, DOS 3.0 or later. D.C. True Ltd., 1840 Oak Ave., Evanston, IL 60201-3686; 708-866-1864; fax, 708-866-1808.
Circle 462 on reader service card

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Oh, Okay, That Really Clears Things Up

"With Word 6.0—a complete rewrite of the program—Microsoft is adopting the same approach with Version 6.0 of its word processing package, which the company is rewriting completely."

—MACWEEK

The Latest on Windows Database Mangers

GROANERS

Q: How many Microsoft programmers does it take to change a light bulb?

A: They don't bother. They just change the standard to darkness.

Why Dr. Ruth Won't Use a Newton

"The Apple Newton MessagePad has a quality feel. It packs a lot of power into a one-pound package about the size of a video cassette that fits in a man's coat pocket or a mid-sized woman's purse."

—THE WALL STREET JOURNAL

FBI, DEA, CIA, IRS-
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Wacky Want Ads

"Secretary/administrator to manage a small market research company. Must have a thorough knowledge of Microsoft Word for Windows."

—THE TORONTO GLOBE AND MAIL

"Computer oper: ... Operate Computer equip to process legal documents; enter commands, use kybds, press buttons, flip switches. ..."

—NEWSDAY

The Direct Approach to Preventing Software Piracy

"License Agreement

What Will Happen If You Violate This Agreement:

You will be in very big trouble. ..."

—NETINC'S NETMENU DOCUMENTATION

Get It While It's Hot:

A Glow-in-the-Dark-Upgrade

"Additionally, as the ABM A2486C-25 Upgrade Chip uses ceramic package, a sufficient radiation effect can be expected."—ABC TRADING CO. AD



ARF on the road:
PayLess Drugstore,
Bend, Oregon.



Richard Tennant

If your entry is used, we'll send you \$50 and a PC Magazine T-shirt. Send your entries to Abort, Retry, Fail?, PC Magazine, One Park Ave., New York, NY 10016-5802. Winners this issue: Alan Steven Adler, Jim Bente, Bruce Crabtree, Randy Easter, Howard Gold, Ray Kaduck, Martin Prince, Liz Tanner, Rosie Wardell, and Mike Wells.

GUARANTEED SERVICE VS GUARANTEED "MAYBE."

OUR GUARANTEE*

If there is a hardware failure with your Dell system while under a service^a contract purchased from Dell and you notify us before 5:00 PM CT, a technician, if needed, will arrive to address your problem by the end of the next business day. In the rare event the technician does not arrive as promised, let us know and your situation will receive top priority for resolution, plus you will receive an additional month of service at no cost to you.

This is our guarantee. If we fail to live up to it, we'll extend your service coverage by one additional month — free of charge. Because we put our money where our mouth is.

The way some people treat service, you'd think that while your computer is down, life just keeps ticking along like nothing's happened.

At Dell, we know that's rarely, if ever, true.

That's why we give every customer service that's absolutely second to none in the computer industry.

Which may explain why we consistently come out on top in customer satisfaction polls.

All of our service technicians are centrally trained, and can have immediate access to your system's history. Give 'em your name and customer number and they'll call your computer configuration up on screen.

When you call our technical support line we guarantee you'll talk to a technical specialist within 5 minutes or less. Or, if you'd rather not hold, a technical specialist will call you back within an hour. In the rare event that we fail to make good on that promise, let us know and you'll receive your choice of a check for \$25 or a \$25 credit towards your next purchase. We're the only PC company to offer this.

GATEWAY'S WEASEL

If we cannot solve a problem over the phone, we may decide that the best way to correct it is to send a technician to your location (assuming, of course, that this service is available in your area). Please understand that the decision to send a technician is solely at Gateway 2000's discretion. Obviously, everyone who experiences the slightest difficulty would love to have a technician come screeching up to the door to personally solve the problem. However, this is not always the best or fastest solution. In cases of disagreement over whether on-site service is to be provided, the Gateway 2000 technician's decision will stand. Your understanding in this matter is appreciated.

Source: Gateway 2000 Customer Support Guide Rev. #3, page 4.

This is our competitor's service guarantee. It's got more weasels than a full-fledged rodent ranch.

In approximately 90% of all cases, any problem you experience with one of our systems can be solved over the phone. Quickly and efficiently.

In the rare case that it cannot, we promise you next-business-day service. And that's a guarantee, too.

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*Guarantees available in the USA only for registered owners of Dell Dimension Systems purchased after 8/1/93. For a complete copy, please call our TechFax™ line at 1-800-950-1329 or write Dell USA L.P., 9505 Arboretum Blvd., Austin, TX 78759-7299. Attention: Dimension Guarantees. ^aOn-site service provided by BancTec Service Corporation. On-site service may not be available in certain remote areas. Dell disclaims proprietary interest in the marks and names of others. ©1993 Dell Computer Corporation. All rights reserved.

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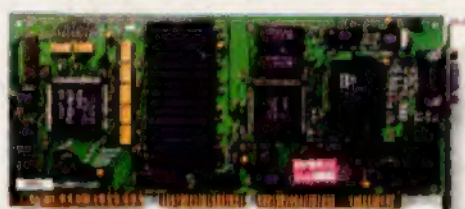
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